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ABSTRACT

A study examined the extent to which professional development could address faculty's concerns about the use of educational technology. The professional development took the form of a series of activities designed to assist college faculty in integrating technology into the curriculum. Subjects, 60 full-time and adjunct faculty at a small liberal arts college, were divided into experimental (n=24) and control (n=36) groups. Subjects were asked to complete two instruments: one measuring stages of concern and a technology use and training inventory. Subjects also participated in focused interviews on their knowledge and use of innovation. Results indicate that the participants in the professional development intervention group demonstrated some changes in the quality of their concerns, moving from awareness and information concerns to personal management and refocusing concerns. (Contains 91 references.) (MSE)

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A Study of the Stages of Concern Expressed by College
Faculty Before and After a Professional Development
Seminar in the Use of Educational Technology in Their
Curricula

by
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A dissertation submitted to the faculty of
Wilmington College in partial fulfillment
of the requirements for the degree of
Doctor of Education
in
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This dissertation is dedicated to my family. Without the loving support of my wife, my children, and my grandchildren, I would not have had the motivation nor the time to complete this project.

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Abstract

The purpose of this study was to examine the extent to which professional development of college faculty could address their concerns about the use of educational technology. The professional development took the form of a series of activities designed to assist a college faculty to integrate technology into its curricula. The study used a modification of the pretest-posttest control group design. Instruments used included the Stages of Concern Questionnaire and the Level of Use Interview from the Concerns Based Adoption Model of the University of Texas. Also used was a Technology Inventory. An experimental group (n=24) and a control group (n=36) were studied. Participants were college faculty from a small liberal arts college in the Middle Atlantic region.

The results of the study indicated that participants in the intervention demonstrated some changes in the quality of their concerns, moving from awareness and informational concerns to personal management, and refocusing concerns.

Chapter I

Introduction

In his keynote address to the October, 1997, meeting of the League for Innovation in Atlanta, Georgia, Dr. Alfredo G. de los Santos, Vice Chancellor of Maricopa Community Colleges, Phoenix, Arizona, began by asking if anyone present thought there would be less, not more technology in general use just five years into the future. He continued by proposing that colleges must become competitive by preparing not only their students for the future but also their faculty. According to de los Santos (1997), by the year 2000, nearly 50% of all college students will take their classes using technology enhancements, yet only 15% of the faculty for those students is comfortable using that technology. De los Santos also observed that preparing faculty to bridge the coming gap in technology is a challenge that colleges must face.

Although educators have used technology in the past, primarily in the belief that the technology would support a superior learning environment, or would, at the very

least, improve access to education (Means, 1994), they have been reluctant to adopt technology for use in the curriculum for many reasons. According to Harvey & Purnell (1996), among those reasons were: an unwillingness to evolve past the status quo, a fair amount of anxiety about the use of technology, and an inability to use technology properly.

Policymakers have looked upon technology as though it were an educational activity, rather than what it is, an educational tool (Glennan & Melmed, 1996). For instance, Glennan and Melmed observed that a computer might serve as a freestanding workstation or networked workstation that provides structured lessons or tutoring, or that supports word-publishing requirements for students preparing class reports. It could also be used to assist students in a multidisciplinary project with other students in the same course, other courses at the same institution, or with other students at different institutions. Such a multidisciplinary project can also include people who are not students. According to Glennan and Melmed, computers can also be used for electronic mail (e-mail) and other forms of collaborative applications, bringing groups of students into activities

that stretch beyond the limits of a typical 50 minute lecture.

Educational technology goes well beyond developing educational activities using technology. According to Brosnan and Lee (1998), as technology became increasingly prevalent in society at large, education seemed to be preoccupied with the teaching of that technology. Little effort was made to use that technology as a way of developing teaching methods.

A Rand Corporation study conducted by Harvey & Purnell (1996) uncovered several reasons for faculty anxiety about technology. One was a decided lack of vision by college administrators of the role technology could play in the future of education, in their institutions, and in their curricula. Glennan and Melmed (1996) cautioned that the lack of vision was also compounded by a lack of experience with the technology since it was rarely available to teachers, causing them to be unable to even imagine the possibilities of its use. The Rand study, according to Glennan and Melmed, further noted that not being able to imagine a practical use for technology may be at the heart of faculty anxiety about technology. They pointed out that while the area of

technology tools is new in professional development, teachers saw little benefit in it for themselves. The result was a "seventeen percent problem," that is, the technicians and early adopters, who comprised 17% of the population, saw a potential for technology and began using it; the majority will not be interested until they see some practical benefits.

In their Rand study, Glennan and Melmed (1996) found general agreement among teachers that the lack of obvious practical benefit was a major contributor to teacher anxiety. The study also suggested that not only most teachers, but also staff developers, did not understand how to think about technology, since they were tied to more traditional methods of instruction and did not understand the possibilities for educational technology. The chief challenge was to find a way faculty members could understand educational technology as an opportunity rather than as a threat.

Another source of faculty anxiety about educational technology, posited by Glennan and Melmed (1996), was a lack of trust by faculty in their institutions to provide them with the support they needed to make technology work. The researchers found that teachers were worried

that they would be blamed for any failure when it was the system's lack of support for the technology that was the root cause of the failure.

Fear about technology and its use had many sources (Glennan & Melmed, 1996). Teachers in the study cited many examples, but a repetitive theme was the traditional school culture and the organization of education. Questions about class length, term length, meeting times, and a fear that technology would not fit into their schedules supported continued anxiety about technology and its use in education. The researchers argued that technology should be used to advance a new kind of school culture supporting a new kind of professional development.

Hechinger (1995) introduced a program called Technology as a Second Language in a project she developed for faculty professional development. In her view, comfort, confidence, and creativity should become the standards for faculty professional development. Her program encompassed a three year life span. The first year was a time for faculty to become comfortable with the technology, the second year for developing confidence in its use, and the third year was set aside for

creativity. Although her program involved small numbers of teachers and required fairly intense prolonged support, it proved to be very successful.

Statement of the Problem

Against the backdrop of concern about educational technology was an often-stated problem. Considering the commitment of resources by educational institutions to educational technology and professional development, these institutions have been greatly concerned about the outcomes of that development on reducing faculty anxiety about the use of technology in the classroom.

Purpose of the Study

The purpose of this study was to examine the extent to which professional development of college faculty could address their concerns about the use of educational technology. The professional development took the form of a technology program that consisted of a series of activities designed to assist college faculty in integrating technology into their curricula.

Need for the Study

Colleges are investing large portions of their annual budgets in the integration of technology into the methodology of learning (Glennan and Melmed, 1996).

Teaching faculty have voiced concerns about their ability to use the technology in the classroom, to integrate technology into their curricula, and, on a more basic level, to understand and use the technology being purchased by their institutions (Glennan & Melmed, 1996). Faculty have called for increased and more specific professional development aimed at helping them understand and use educational technology. Faculty have also expressed concerns about technology in general, concerns that have often manifested themselves in the form of anxiety, phobia, and a lack of comfort with the technology confronting them. Miura (1987) expressed a concern that the ability to easily adapt to technology, especially technology in the workplace, may become a critical filter for well-paid jobs as well as for careers. This concern, often turned around as a fear that faculty without critical technology skills will become surplus to the education mainstream, is often expressed by faculty in concert with a call for less, not more, technology (Glennan & Melmed, 1996). This study attempted to help faculty and administrators understand the linkage between professional development and a reduction in concerns, anxiety, and an increase in comfort associated

with the use of technology to support college instruction.

Research Question

This study examined two questions. The first question was, "What is the effect of a professional development program on faculty concerns about technology?" The second question was, "To what extent are the faculty using educational technology in their classrooms?"

Hypotheses

The null and alternative hypotheses for the first research question were:

H_0 : There is no change in faculty concerns that as a result of participating in a workshop on using technology in their courses as measured by the Stages of Concern Questionnaire.

H_1 : H_0 is false.

The null and alternative hypotheses for the second research question were:

H_0 : Faculty were not using technology in their classes.

H_1 : H_0 is false.

Definition of Terms

Anxiety. In the context of this study, this term refers to "the fear and apprehension felt by an individual when considering the implications of utilizing technology, or when actually using the technology. The individual is in the state (of anxiety) because of the fear of interaction with the technology, even though the technology poses no real or immediate threat" (Maurer, 1983, p.92).

Concern. This term refers to "the composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task" (Hall, George, & Rutherford, 1986, p.5).

Concerns-Based Adoption Model (CBAM). This term refers to ". . . a model of innovation adoption . . . that assumes change to be a highly personal and lengthy process, one that affects individuals differently. The model hypothesizes two dimensions along which individuals grow as they become more familiar with and sophisticated in using innovations: Stages of Concern About the Innovation (SoC) and Level of Use of the Innovation (LoU)" (Loucks, Newlove, & Hall, 1975, p. 1).

Educational Technology. This term refers to ". . . a systematic process involving application of knowledge in the search for replicable solutions to problems inherent in teaching and learning. It includes the products of this process, it is a profession, and it is an academic specialty within the larger discipline of education. The main goal is cost-effective achievement of measurable learning objectives to help students achieve high-level, worthwhile objectives" (Hackbarth, 1998, pp. 11-12).

Levels of Use of the Innovation (LoU). This term ". . . describes the behaviors of the users of an innovation through various stages - from spending most efforts in orienting, to managing, and finally to integrating use of the innovation" (Hord, Rutherford, Huling-Austin, & Hall, 1987, p. 54).

Professional Development. Within the educational context, this term ". . . includes the legally sanctioned and supported learning opportunities provided to faculty by the school and school system" (Glickman, Gordon, & Ross-Gordon, 1995, pp. 8-9).

Stages of Concern About the Innovation (SoC). "As a component of the CBAM, this dimension focuses on the

feelings, thoughts, and information needs of the innovation user" (Loucks, Newlove, & Hall, 1975, p. 1).

Technology Anxiety. This term refers to "the fear and apprehension felt by an individual when considering the implications of utilizing technology, or when actually using the technology. The individual is in the state (of anxiety) because of the fear of interaction with the technology, even though the technology poses no real or immediate threat" (Maurer, 1983, p.92).

Technology Culture. - In this study, this term was used to define the concept of the shared values, beliefs, attitudes, symbols, and processes of individuals who embrace technology as an important part of their work and private lives.

Chapter II

Literature Review

This review of the literature reflects the examination of research in four broad areas: institutional uses of educational technology, anxiety related to the use of that technology, faculty concerns and anxieties, and professional development. Additionally, the review examined studies which used the Concerns Based Adoption Model (CBAM) and two of its three components, the Stages of Concern (SoC) questionnaire and the Levels of Use (LoU) interview. The third CBAM component, Measuring Innovation Configurations (MIC), was not used in this study. The focus of the MIC was on adoption and implementation of change at the institutional level. It had broad policy implications and was outside the scope of this study.

Inclusion Criteria

The research for this review was conducted using ERIC, First Search, the Internet, and the Education Index. The resources of the libraries at Wilmington College, Delaware Technical and Community College, the

University of Delaware, and other regional libraries, which housed the results of those searches, were used.

Studies were selected for inclusion in this literature review if they were: concerned with the introduction of innovations in education and involved faculty professional development; or concerned with the use of the CBAM instrument measuring faculty development in higher education or faculty development in educational technology regardless of teaching level. This review is organized into four broad areas: institutional uses of educational technology, anxiety related to the use of that technology, faculty concerns and anxieties, and professional development.

Institutional Uses of Educational Technology

Sandholtz, Ringstaff, and Dwyer (1997) warned against adopting technology just to continue the old ways of teaching. Instead, they argued, any new instructional system incorporating technology should create time for faculty, improve the quality of group decision-making, and reduce the amount of administrative activities engaged in.

Sandholtz, Ringstaff, and Dwyer offered three guiding principles for technology inclusion in

curriculum. First, effective technology inclusion needed to be student-centered and student-owned. Technology as a tool needed to be integrated into every aspect of school life and the curriculum and a student's needs should drive technology, not the reverse. Second, the new direction for technology inclusion should be driven more by faculty interest and motivation than from direction mandated from administrators. In other words, Sandholtz, et al. observed the ending of teacher isolation and building human networks in an infrastructure that included teachers, administrators, the community, and the students. Finally, according to Sandholtz, et al., schools and colleges had to become "safe havens" for learning and growth and the inevitable mistakes that accompany both.

Glennan and Melmed (1996) also pointed out some limitations and practical difficulties with incorporating technology in teaching. First, they discovered a repeated concern that educational technology was really not that advanced. Their study reported that many educators have had a lot of disappointments in terms of overestimating the capabilities of technology and in dealing with the disillusionment when expectations are not met. Hechinger

(1995) noted that in her Technology as a Second Language project, extensive suites of software were loaded onto faculty computers. She envisioned the faculty in her study using the software in a seamless fashion, but she ran into an early obstacle when the server purchased to handle the connectivity proved to be too slow and short on memory to handle large numbers of faculty connections. This experience proved to be particularly frustrating because the technology proved to be less efficient than ordinary paper and pencil solutions.

Glennan and Melmed (1996) pointed out that many institutions have invested heavily in technology in the past. A problem was that many of the previous acquisitions are so vastly different from the new purchases that they impeded cross communication rather than advancing it. They also were concerned that future technology purchases would require continued staff training and additional costs with no promise of real change.

One problem uncovered by Glennan and Melmed (1996) in their Rand-sponsored study, was the difficulty in assessing the quality of technology materials. They found no standard for measure and comparison, and while there

was much to be found on the Internet and in software packages, much of it was produced and made available with no peer review or professional certification.

Martel (1988) observed that the pedagogical principles of reinforcement, feedback, practice, and whole versus part learning, were easily adapted to student learning with the introduction of technological means. When behavior was rewarded, it tended to be repeated; mastery at one level encouraged attempts at a higher level. Feedback, or knowledge of results, was enhanced with collaborative techniques. Students gained insight into their accomplishments through sharing processes and results, thus furthering and deepening learning. Practice tended to improve overall skill development and knowledge retention, freeing the student to consider related tasks. Thus, practice supported retention and transfer of learning by doing. Martel thought that behaviorists believed that learning takes place when students master a series of individual tasks and assemble them to form a whole. He also thought that cognitivists believed much is gained by students who learn to observe the whole and learn to use smaller parts to integrate them into a solution. This, Martel

purported, led to student-centered or student-directed learning. He indicated that when a student was empowered to learn how to learn, student and teacher roles changed but did not diminish. Instructors had to identify resources and guide students to the effective selection and use of those resources. The instructor became a facilitator of learning rather than a vendor of learning.

According to O'Connor (1996), student-centered learning methods abound. He stated that the technologies existed to enhance each of four student-centered learning principles, both in the classroom and at a distance, done either synchronously or asynchronously. He divided these methods into two general types: student directed and teacher directed. Student directed methods included the use of software tutorials, audio and video tapes, computer-based training, interactive video, compact disc, and helpdesk or on-line help. Teacher directed included all of the same methods but with teacher directed demonstrations, one-on-one assistance, video and audio tape lecture, electronic exercises, split screen computer software that enabled the student and the teacher to work through exercises, problems, or to develop strategies for learning. Emerging technologies existed to deliver just-

in-time instruction and instructional support. Similar to coaching, this method allowed the student to direct what is learned. Regan (1994), a system specialist, defined this technology as a performance support system that directly links training and support to performance.

Brunner (1992) reported that much traditional, as well as student directed learning, took place outside the classroom. In the past, he added, this was mainly homework exercises, fieldwork, group study sessions, and instructor office hour visits. Now with educational technology, learning continued with the assistance of electronic mail, newsgroups, and on-line live chat conferences. Learning also took place synchronously, so that all students were present with the teacher at the same time or location (or both); or asynchronously, with students apart from one another and the teacher either in time or location. According to Brunner, asynchronous education has developed a special set of strategies, generally captured by the term distance learning or distance education.

Many institutions use educational technology towards two ends: reducing educational costs and furthering their involvement with distance education projects (Morse,

1997). Distance education has been a part of the educational scenario for quite a long time. The term appeared for the first time in the 1892 catalog of the University of Wisconsin (Rumble, 1986), but the term was popularized by the Europeans, mainly the British and Germans (Peters, 1968). Early use of distance education applied mainly to courses offered by mail (Moore, 1987), and that use evolved into correspondence courses, mainly offered to rural consumers in the early part of this century (Peters, 1968).

Early American use of distance education was traced to the Society to Encourage Study at Home. This organization was founded in 1873 by Anna Eliot Ticknor, who originated the exchange of comments as well as grades with students (Aggasiz, 1971). The Chautauqua movement, a popular education society based on the idea of expanding access to education to all Americans, was begun in 1878 by John Vincent (Moore, 1987). The program became accredited by New York state, and a major disciple of the movement, William Harper, founded the first university-level correspondence study division at the University of Chicago at the end of the eighteenth century (Verduin & Clark, 1991).

The first use of distance education as a method for assisting large numbers of employees to upgrade their skills or complete a degree was not documented (Moore, 1987); however, a major use of correspondence study was made by the US military during World War II, and later during the Cold War period, using the resources of the University of Wisconsin (Rumble, 1986).

The literature seems to indicate that many institutions are using technology. They seem to be concerned about how technology can be adopted and integrated into the curriculum, how the quality of the instruction can be assessed, and how students can be engaged and included using educational technology. This study selected an educational institution that was on the verge of incorporating extensive use of educational technology, but that had some experience with it in the recent past. The workshops created for this study took into consideration the beliefs of what Martel (1988) called behaviorists and cognitivists. That is, the workshops incorporated both individual tasks that could be mastered, collected, and sequenced into a larger whole (the behaviorist approach), and observation of the entire

product and learning the individual tasks that comprise the whole.

Technology Anxiety

Technology anxiety defined. The literature produced numerous attempts at defining and qualifying anxiety as it relates to technology, including computers. Epstein (1972) analyzed a range of definitions and proposed a general description of anxiety as "a state of diffuse arousal following perception of threat, or alternatively, as unresolved fear" (p. 334).

Spielberger (1966) was the most commonly cited reference for definitions about anxiety. He identified two types of anxiety, or A-states, trait anxiety and state anxiety. These two terms were further developed by Cambre and Cook (1985) who described the concepts thusly:

Trait anxiety was defined as a unitary, relatively stable and permanent characteristic. State anxiety was conceptualized as a transitory condition which fluctuated over time and treatment. Spielberger further refined and clarified the concepts defining anxiety states (A-states) as subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system and an anxiety trait (A-trait) as a motive or acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively non-dangerous circumstances as threatening, and to respond to these with A-state reactions

disproportionate in intensity to the magnitude of the objective danger. (p.39)

Technology seemed to provide numerous opportunities that can be perceived as threatening. Raub (1981) defined technology anxiety as a form of state anxiety, with the technology providing the personally threatening stimulus. Many of the computer anxiety questionnaires used in the field today were validated against the state anxiety questionnaire developed by Spielberger (1966). Consequently, the research on anxiety has been extended to include technology anxiety. Raub (1981) argued that technology anxiety is an interaction between state and trait anxiety, indicating that an individual's level of technology anxiety may change over time, but the extent of that change may depend on the individual's level of trait anxiety.

Sievert et al (1988) distinguished between anxiety and fear by defining anxiety as:

an exaggerated state of fear that motivates a variety of defensive behaviors, including physical signs, conscious apprehensiveness, or disorganization. Fear, on the other hand, was caused by external realities in the environment (p. 32).

Maurer (1983) defined technology anxiety as:

The fear and apprehension felt by an individual when considering the implications of utilizing technology, or when actually using the technology. The individual is in the state (of anxiety) because of the fear of interaction with the technology, even though the technology poses no real or immediate threat (p.92).

Thus, while Sievert et al (1988) distinguished anxiety from fear, Maurer (1983) defined anxiety as fear. Howard (1986) appeared to have agreed with the latter definition. He defined technical anxiety as "fear of impending interaction with technology that is disproportionate to the actual threat presented by the technology" (p. 34).

Maurer and Simonson (1984) began to develop a list of behavioral manifestations that would be indicative of an anxiety about technology. Their list included: behaviors that avoided technology and the areas of an institution, organization, or the community that housed technology; excessive caution exercised when confronted with technology; making negative comments about technology; and underplaying the need for technology by working extensive work-arounds or avoiding activities

that are made simpler by including technical means of assistance.

The fear of technology seemed to know no cultural bound. A cross-cultural study of students from universities in the United States and the People's Republic of China, designed to determine if technical anxiety were present and to what degree it was present in students from both cultures, was conducted by Marcoulides and Xiang-Bo Wang (1990). Using the computer anxiety or technology anxiety rating scale validated against the state anxiety scale developed by Spielberger (1966), the researchers found technology anxiety was present to a similar degree in both American students in the United States and Chinese students in the People's Republic of China. Brosnan and Lee (1998), using a similar instrument as was used by Marcoulides and Xiang-Bo Wang, found similar results when comparing Chinese students in Hong Kong and British students in the United Kingdom. Weil and Rosen (1995) found similar levels of technology anxiety in ten countries. They also used a computer anxiety or technology anxiety rating scale validated against the state anxiety scale developed by Spielberger.

The instrument used in these studies was the Computer Anxiety Rating Scale (CARS), which employed a Likert-type scale that contained both positive and negative elements to control for response bias. Much of what was contained in the CARS was the basis for the Technology Inventory used in this study.

Technology anxiety and experience. This study was primarily concerned with the question of whether training in and experience with technology reduces the anxiety about that technology. The literature indicated that those with greater experience in an area tended to be less anxious about that area (Maurer & Simonson, 1984; Spielberger, 1966). This, however, begged the question of whether the experience reduced the anxiety or whether reduced anxiety led to greater experience. Morrow et al. (1986) found experience to account for the largest amount of variance in computer anxiety. In his study, Morrow measured computer anxiety using the CARS with three groups of university students: those with no computer experience; those with training, but little use; and those with training and extensive use. Loyd et al. (1987) found that college students with more than one year of computer experience were less anxious about

computers than those with less than one year's experience. The fact that some studies have identified a relationship between greater prior experience and lower anxiety could not be taken to imply that greater experience resulted in reduced levels of anxiety. The converse, that lower levels of anxiety produced higher levels of experience, seemed also plausible. The critical result of anxiety seemed to be that, when offered a choice of using a piece of technology or not using it, anxious individuals opted not to use it (Campbell, 1988). Consequently, technology experience sometimes reduced technology anxiety (Gilroy & Desai, 1986; Leso & Peck, 1992; McInerney et al., 1994; Raub, 1981) and often resulted in increased levels of anxiety (Carlson & Wright, 1993). Studies by Marcoulides (1988) and Rosen et al. (1987) found that individuals who were anxious about technology did not necessarily avoid technology altogether, but rather attempted to minimize interaction, which reduced the level of what was achieved with the technology. Thus, performance has been considered as having weak predictive power by some (Kernan & Howard, 1990).

Several researchers conducted action research using the students they taught in their own universities and colleges. During a 16 week BASIC computer language course conducted for college students, Reed and Palumbo (1992) found that anxiety was reduced during the first four weeks of a computer course and that performance was subsequently improved over the remaining twelve weeks. Reed and Liu (1992) found that managing errors results in a reduction in anxiety. Friexe et al. (1991) concluded that technology training that emphasized identifying, correcting, and managing errors such as program faults, file storage errors, and typographic errors, was most effective in reducing anxiety and in improving performance.

Attitudes about technology. Fishbein and Ajzen (1975) described attitudes as learned predispositions to react to an object in either a consistently positive or consistently negative way, measured along an affective dimension. Initial technology attitude research found that attitudes toward computers were strongly related to attitudes about mathematics (Benbow & Stanley, 1982). Jenks (1990) argued that attitudes were strongly related to, and tended to be formed ahead of, values. She noted

that changing attitudes was a difficult and lengthy process. With respect to technology and other work or educational processes, Jenks (1990) indicated that changing experiences about those ideas, concepts, behaviors, and relationships for which people have held negative attitudes, helped shape new attitudes about technology, work, and education. This process of moving from negative attitudes about technology toward more positive attitudes about technology was conducted using "value transformation, detaching negative experiences from values to positive experiences, creating a positive attitude (p.49)." Keisler and Sproull (1978) stated:

value transformation means coming to believe that the new technology is instrumental to one's work and life. It also means holding symbolic beliefs in the legitimacy and value of computing, regardless of whether computers are actually used (p.22).

The belief that attitudes can be both positive and negative was apparently important in the construction of programs designed to reduce anxiety about technology. Glass and Knight (1988) focused on student expectations of performance rather than on student demographics. They found that an expectation of poor performance (a negative attitude) was an important factor in technology anxiety.

The same study by Glass and Knight, found that an expectation of high or improved performance (a positive attitude) was an important factor as well. Other studies (Clement, 1981; Munger & Loyd, 1989) concurred that students in small liberal arts colleges with positive attitudes about technology performed better with the technology than those with negative attitudes.

The research on anxiety about technology seems to indicate that students who have expectations of doing well do better than those who do not. The research also seems to indicate that experience may be a factor in improved performance, but that finding is tempered by a discovery that some technology anxious students may use the technology when forced to but avoid it when possible and then stop using it as soon as they have concluded the immediate task at hand. This study took these findings into consideration by designing its workshop to account for experience, prior and continuing anxiety, and current use, with respect to technology.

Concerns and Anxieties about Technology

Research in the area of teachers' concerns began with a study by Phillips (1932) into the problems of adjustment for teachers in their early career years.

Since then, many other researchers: Gabriel (1957); Sawrey and Telford (1959); and Travers, Rabinowitz and Nemovicher (1952) have analyzed the problems of teachers, mainly focusing on the anxieties and concerns of student and inservice teachers.

Travers, Rabinowitz, and Nemovicher (1952) administered a 21-item sentence completion instrument to 120 elementary-level student teachers in Texas prior to and after their student teaching practica. Anxiety was the focus, and the authors' data showed the main source of anxiety was the student teachers' concerns about discipline in the classroom and, almost equally, a concern about whether or not the students would like them as teachers.

In a large (N=736) study about teachers' concerns about their professional abilities conducted in Houston, Texas, Gabriel (1957) used both inexperienced pre-service teachers and experienced inservice ones. His data demonstrated that inexperienced teachers raised concerns about such problems as criticism from superiors and maintaining discipline in the classroom, while expressing satisfaction with praise and holidays. Experienced teachers, on the other hand, expressed both concerns and

satisfactions that centered on pupil progress. Slow progress of pupils was the major concern and success of former pupils was the major satisfaction.

Thompson (1963) asked 125 student teachers in Texas who were about to complete their student teacher practica to respond to a 35-item checklist. They were asked to indicate which anxieties they had experienced, to report whether the anxiety occurred before or during student teaching, and to identify the source of the anxiety. Thompson used a recognized definition of anxiety that had an underlying assumption that anxiety was a mixture of, fear, apprehension, and hope in reference to some future event (Sawrey & Telford, 1959).

Perhaps the most renowned series of studies on the subject of teachers' concerns and anxieties were published by Fuller during the mid to late 1960s. Fuller, a counseling psychologist, proposed a developmental view of teachers' concerns (1969). According to Hall, George, and Rutherford (1986), Fuller proposed three phases of concern:

Pre-Teaching Phase: Non-Concern

These students rarely had specific concerns related to teaching itself. The teaching-related concerns they did express were usually amorphous and vague:

anticipation or apprehension.... This pre-teaching period seemed to be a period of non-concern with the specifics of teaching, or at least a period of relatively low involvement in teaching (p. 3).

Early Teaching Phase: Concern with Self

This phase consisted of a set of Covert Concerns: Where Do I Stand? And a set of Overt Concerns: How Adequate Am I? These concerns are most frequent with student teachers and beginning teachers. The "Where Do I Stand?" concerns were reflected in teachers trying to estimate how much support they will have from their supervising teacher and the principal and the limits of their acceptance as professional persons within the school. The overt "How Adequate Am I?" concerns dealt with classroom control and the larger concern of general adequacy and preparedness to handle the classroom situation (p. 3).

Late Concerns: Concern with Pupils

These concerns were characteristic of experienced, superior teachers. Concerns focused on pupil learning and teacher professional development (p. 3).

Fuller (1969) later refined her phases into three main stages: self, task, and impact. She then sub-divided the "impact" stage into three to five levels, depending on the type of institution and grade level being taught. From these premier studies, Fuller worked with others to develop a method to prepare pre-service teachers for the profession (Fuller, Parsons, & Watkins, 1973), and a guide for professional development dealing with the

identification and resolution of concerns (Fuller & Bown, 1975; Fuller & Manning, 1972).

Following Fuller's studies, Hall, George, and Rutherford conducted extensive research into the transfer of Fuller's developmental approach to the process of change itself. Beginning with the 1969-70 academic year, the Inter-Institutional Program of the Research and Development Center for Teacher Education at the University of Texas began to examine on-going field work being conducted by member teachers from across the spectrum of elementary through higher education. Qualitative data produced from taped interviews and observation reports were collected over the period and were used to formulate the Concerns-Based Adoption Model.

The literature about faculty concerns seems to indicate not only the presence of concerns about educational technology and other innovations, but also that the concerns transform over time. This study used the CBAM as its primary instrument.

Professional Development

The professional development of educators has undergone many changes over the past century and a half (Tyler, 1971). This section of the literature review

considered professional development in two broad areas as they related to the subject of this study: the historical context of professional development and the structure of professional development.

The Historical Context. According to Tyler (1971), teachers in the mid-eighteenth century had virtually no training specifically related to how to teach or how to manage a classroom. They received much advice from influential local lay people on how to maintain order in the classroom, how to develop obedience, and how to administer corporal punishment. These same lay people had no concept of how to help teachers teach. For this they referred teachers to either learn through experience, or to depend on institutes which provided short resident courses for those who lived in or nearby large cities, or to take correspondence courses for those who did not. The purpose of these courses was remedial; that is, to help teachers bridge the gap between what they were expected to know and what they knew.

At the same time, according to Tyler, the concept of continuous development of teachers or their methods was not recognized. The teacher was considered as an artisan. It was ideal for the teacher, as it was for the master

artisan, to continue to study and learn so that every day the teacher would become a greater master of the art of teaching.

Tyler also noted that technological and social change was slow-paced in the early years of teacher professional development. School learning was not considered necessary for most citizens. Most students did not go on to colleges and universities since Latin and Greek were necessary prerequisites to acceptance, and these subjects were not in the curricula of most American public schools. The movement toward support for those that dropped out was slow to emerge. Widespread support did not emerge until the passage of the Morrill Act, which granted land to the states to establish colleges meant to serve the agricultural and mechanical classes, the population most prone to dropping out of the traditional public schools. Tyler contended that, while the Act was intended for colleges, most of the established institutions actually accepted students who had not completed their public education. College calendar time at these colleges was split between providing remedial basic education and advanced agricultural and mechanical education. This Act changed

the outlook at the public school level. The curriculum was no longer stable. Soon, teachers found that the curriculum had to change to meet the needs of the students being served. In this period, too, the ideas of Darwin and other modern scientists were influencing some educators to look more carefully at the teaching-learning situation and to try new ideas in the classroom. All of these changes had the impact of forcing professional development to prepare the teachers for their new roles in the development of curricula and in meeting diverse student needs.

The Structure of Professional Development. Loucks-Horsley and Stiegelbauer (1991) have indicated that staff development is about change. They maintained that the structure of staff development has been influenced by the evolving body of literature on the subject of change.

Schumm and Vaughn (1995) suggested that teachers are not likely to change their teaching behavior unless they are given the skills, knowledge, and confidence to do so. When new content or new skills were presented over a series of training sessions that included a limited amount of information, and these sessions were followed by opportunities for classroom practices with coaching,

changes in teaching were more intense (Guskey, 1986; Joyce & Showers, 1983; Joyce & Showers, 1988; Sparks, 1983).

In the past, staff development activities focused on isolated instructional behaviors such as cooperative learning. However, Reys et al. (1997) have indicated that the complex array of teaching behaviors necessary for successful technology integration into curricula has produced needs for new programs which address behaviors, attitudes, dispositions, and comfort levels. They continued with a set of factors they deemed important in constructing a successful staff development effort for technology integration. They recognized that not every change program will incorporate all of the factors, but they stressed that the more successful programs adopted significantly more of the factors than those that were less successful. Their factors are contained in Figure 1. In developing their social cognitive theory, Bandura and Adams (1977) indicated that self-efficacy was the one important factor in having teachers become successful in the transition to new curricular strategies. They defined self-efficacy as teachers' perceived ability to perform the task, that is, the belief that they can activate the

- Long-term effort
- Technical assistance
- Emotional and intellectual support networks
- Opportunities that stimulate and promote intellectual growth
- Collegial atmosphere in which teacher share views and experiences
- Opportunities for reflection on one's own practice
- Focus on teaching for understanding through personal learning experiences
- Encouragement to make small changes and to learn from them
- Pedagogy of professional development congruent with pedagogy desired in classrooms
- Professional development grounded in classroom practice

Figure 1. Factors in Successful Staff Development Programs. From Reys, B. J., Reys, R. E., Barnes, D. Beem, J. & Papick, I. (1997). Collaborative curriculum investigation as a vehicle for teacher enhancement and mathematics curriculum reform. School Science and Mathematics, 97, 253-259.

behavior required to produce the desired outcome. Bandura (1982) distinguished between efficacy expectancies and outcome expectancies: efficacy expectations equated to convictions about successful behavior execution, and outcome expectations equated to estimates that the behavior would lead to the outcome. Therefore, outcome expectations related to participant behaviors (Crawley & Koballa, 1992; Cuban, 1979; Haney, Czerniak, & Lumpe,

1996), while efficacy expectations related to participant attitudes (Bandura, 1982; Haney, Czerniak, & Lumpe, 1996; Locke, Frederick, Lee & Bobko, 1984).

Professional development programs needed to effect changes in behavior in several dimensions of teacher attitude, belief, and practice and to provide opportunities for teachers to repeatedly experience success (Loucks-Horsley et al., 1989).

According to Bandura and Adams (1977), teachers developed expectations of their ability to perform certain actions from four major sources of information: performance accomplishment, modeling, verbal persuasion, and emotional arousal.

While developing a professional development program at Salisbury State University, Armstrong (1996) identified a three level approach to professional development with technology, which he labeled basic, intermediate, and advanced. His model presumed creating a small core of teachers who were exposed to the technology and trained in the skills necessary to implement that technology into their curriculum. Each of the three levels contained presentations relevant to the subject matter taught by the core of teachers. At the basic

level, teachers used a mechanical, predictive approach to the technology. At this level, faculty used low-end presentation software, such as PowerPoint, to develop simple presentations. Their work was saved in a format that made it easy to transfer their work to advanced authoring software packages used at higher levels. Faculty spent their time at this level transferring their notes and overhead transparencies to the new medium. Relating this to the work of Bandura (1982), it seems as though one would expect the facilitators to develop faculty outcome expectations; that is, expectations that if the faculty performed the functions of the technology in the correct order, the outcome would be predictive and successful. Thus, basic level outcomes were concerned mostly with behavior. Armstrong found that faculty also expected to move their new media skills directly to the classroom. He also found that, for those instances where that was not possible, faculty turned off to the prospect of technology in their curriculum, rarely to return to the concept.

Armstrong (1996) also expected faculty who were successful at the basic level to move to the intermediate level. At this level, faculty spent most of their time in

a one-to-one relationship with an instructional designer or a faculty person who was already at the advanced level. Time was consumed with learning multimedia conceptual mapping, a process of functioning cognitively at a multi-dimensional level and learning storyboarding, project planning, and other tasks. At this level, the faculty processed their work by learning and discovery, rather than by getting information from an expert. This level seemed to relate rather well to Bandura's (1982) efficacy outcomes. At this level, the facilitator was very concerned with the faculty developing a proper attitude about technology and its ability to change teaching methods.

Armstrong's (1996) third level, advanced, was a refinement stage, and tended to have no definite ending point. At this level, the faculty refined their work, developed new presentations, researched other methods, and became a model to other faculty.

In an approach developed for Ithaca College in New York, Shapiro and Cartwright (1998) outlined several approaches to infusing technology into the curriculum. Their professional development ideas were organized into ever growing and varied spheres of influence, from the

school or college to multi-college arrangements, and to partnerships with other institutions and businesses. Their first sphere was the faculty development center. They studied two models for this sphere: the in-house center with equipment, technical support, and creative support for instructional staff; and the virtual center, supporting individual faculty members with grants for projects and tuition for external training.

Their second sphere, the consortium approach, was designed to develop relationships among colleges. The Teaching, Learning, and Technology Roundtable (TLTR) was offered as an example of a collegiate relationship. The TLTR was highlighted by Shapiro and Cartwright because it supported local consortia of colleges in an effort to provide a forum for the diffusion of educational technology ideas and as a marketplace for the exchange of ideas and concepts which motivate faculty to adopt and use technology.

Their third sphere, partnerships, encouraged colleges to develop relationships with the business community and with local K-12 teachers to upgrade technology skills, create technology demonstration

projects, and prepare graduates for a technology-rich work environment.

In a study of professional development practices in six school districts in New York State, Lauro (1995) offered five approaches to professional development, all designed to gain the acceptance of faculty, administrators, and other stakeholders. His first approach, comprehensive, consisted of bringing a combination of experts and trainers into a college or school district to direct staff development sessions and to train staff members. He deemed this to be the most effective because it provided consistent training that focused on specific goals and objectives. Lauro indicated that the financial commitment of administrators, the support of experts and trainers, and the involvement of faculty fostered a greater percentage of faculty buying into technology inclusion in curriculum. He also added that this approach has taken, on average, four to five years and tended to be high cost.

Lauro's second approach, the "One-Shot Deal", was probably the most common he encountered. With this scenario, an expert, or panel of experts would be commissioned by a college or school district to provide a

one to three day series of inservice workshops and group sessions designed to focus on one small part of the technology. According to Lauro, normally, a presenter would arrive at the college or school district, conduct the inservice, and was able to arouse the interest of usually a majority of the faculty to try the new technology. Later, faculty began to adopt some or all of the technology. However, because of little or no reinforcement from the expert, panel, or others, when stumbling blocks began to occur or questions arose which could not be answered, the new technology was abandoned and faculty reverted to their old ways of instruction. Lauro found this approach to be expensive, mainly because of a lack of follow-through.

Lauro's third approach, conferences, could be seen as a way for some members of the faculty to acquire massive amounts of information in a conservative amount of time. However, he saw this massive amount of information as being both an advantage and a disadvantage. According to Lauro, although conference attendees had the opportunity to learn about many forms of educational technology at once, they also had the responsibility of determining which ideas and which

technologies were valuable. Lauro indicated that acceptance of new ideas suffered because those who attended the conference lacked the experience to make judgements about the relative utility of various technologies, yet had the assignment of training others. Additionally, many faculty who had not had the opportunity to attend the conference would resent the few who did attend, further obstructing the learning process.

A fourth approach, "in-house professional development", was seen as very effective since a trained college resource was available not just for training, but for follow-through. The challenge that Lauro found to this approach was twofold: gaining the support of faculty to view the assigned staff member as credible, and gaining the support of administrators to provide continued financial support.

Lauro's fifth and final approach, "holistic video-based", consisted of a full school year of monthly reinforcement for a selected narrowly focused use of educational technology, in video format. The videos were used as a source of constant renewal, motivation, and long-term change for faculty. However, according to Lauro, while administrators relished in the expertise

that the videos brought to their campus, faculty benefited most from seeing other teachers teach. Therefore, Lauro concluded that a combination of the videos and hands-on examples concerning the educational technology focus for the school was the basis for the success of this approach.

The Apple Classrooms of Tomorrow (ACOT) Project.

Perhaps the most comprehensive approach to technology diffusion into educational curricula was developed by Apple Computers beginning in 1985 (Sandholtz, Ringstaff, & Dwyer, 1997). The Apple Classrooms of Tomorrow (ACOT) project was a research and development collaboration among public schools, universities, research agencies, and Apple Computer. The goals of the project were: to install and operate computer-saturated classrooms at every grade level (K-12); integrate instructional technologies into the fabric of teaching; bring about positive educational change; and, study and understand the impact of total computer access on students, teachers, and the instructional process. The project was managed through a think-tank, established by Apple Computer, that was organizationally separate from the company's sales, marketing, and product divisions.

According to Sandholtz et al., after soliciting proposals from interested schools, ACOT began work with five schools in four states. The schools represented a cross-section of American schools in terms of grade level, socioeconomic status, and community setting. Each site began with one classroom the first year, then added additional classrooms, staff, and students in subsequent years. None of the sites encompassed an entire school. ACOT asked that the gender and ethnic composition of each incorporated class mirror the school as a whole.

Sandholtz et al., documented the contribution of each participant in the project. The researchers indicated that Apple equipped each classroom with computers, printers, scanners, laser-disc and videotape players, modems, CD-ROM drives, and a variety of software packages. ACOT provided each teacher with two computers, one for the classroom and one for home. Since the hardware at the beginning of this project in 1985 was big and bulky, the two computer approach was the only way to simulate a time when students and teachers would have constant access to technology through laptops. Project teachers were all volunteers selected by the individual schools. Teaching experience ranged from one or two years

to over 20 years. Ages ranged from the mid-twenties to mid-fifties. Most elementary teachers were female, but middle and high school teachers were about half female and half male. Few of the teachers had more than a cursory level of prior knowledge and skill with the computers. ACOT staff provided training for the teachers in telecommunications, basic troubleshooting, and software. ACOT also provided funding for a coordinator at each site to provide technical and instructional assistance.

Sandholtz et al., noted that ACOT's vision for the project went far beyond the notion of computers as teaching machines, a concept widely held at the beginning of this project. Technology was seen as a tool to support learning across the curriculum, using the tool that best supported the existing curriculum. As new technology became available, it was provided to each of the sites.

Sandholtz et al., also noted that to investigate the impact of technology on project classrooms, ACOT sponsored research involving more than 20 universities and research institutions. The project required each teacher to provide on audiotape a reflection of a week's activity involving the technology. Additionally, each

teacher completed a weekly electronic report which was distributed to all participant members including other teachers, administrators, researchers, and the ACOT staff.

According to Sandholtz et al., to fully support the use of technology, the ACOT findings found professional development to be woefully inadequate. Only one-third of all K-12 teachers has had at least 10 hours of computer training (United States Office of Technology Assessment, 1988, 1995). The ACOT staff noted several barriers to change that they recommended had to be addressed in future staff development: limited access to the technology; technical problems with the technology; and a lack of time to explore, reflect, and interact with other teachers about the technology. Sandholtz et al., noted that several impacts on the classroom and on the school were also identified: comfort with technology led to improved student motivation and learning; use of technology led to teacher use of new instructional methods; experience with technology led to changes in teacher attitudes not just about the technology, but towards teaching as well.

These findings led to the development of a staff development model by Yocam (1997). The model incorporated five stages: entry, adoption, adaptation, appropriation, and invention. Entry stage participants were trained using fairly standard staff development methods such as workshops. The goal at this stage was to make the participants comfortable with both the technology and the ACOT project. Adoption stage participants were allowed open use of the computers, with assistance available but not mandated. The goal at this stage was to allow the participants to make mistakes, discover options, and begin to have comfort with the array of technologies available. The adaptation stage was a time for participants, working in teams of three to four, to develop teaching units that incorporated technology. The goal at this stage was to adapt existing materials into the new technology. The appropriation level was designed to allow participants to own the technology, that is, to become so comfortable with the hardware and the software that they began to use it without hesitation. The invention stage was an on-going stage during which participants invented their own software packages, multimedia packages, and other technology-rich

educational experiences for their students. Some of these invention stage activities were developed using materials not part of the ACOT project package.

In his review of the ACOT findings, Yocam (1997) reported that professional development for technology was not episodic, but ongoing. The focus of change and development centered not on the workshops and technical assistance, but on conversations teachers had with each other, in person, by e-mail, in meetings, or over the phone. According to Yocam, professional development followed six principles:

1. [Professional] development was situated in contexts of practice so that attendees saw new teaching strategies modeled during routine school days.
2. Participant teachers attended in teams of two to four with members from the same school. This principle was intended to help reduce the isolation that many teachers felt during the change process.
3. A constructivist learning approach was used with participating teachers.
4. The coordinator engaged teachers in an ongoing conversation and reflection about their practice, their students, theories of learning, assessment, technology, and how they might begin to change their classrooms.
5. Participant teachers developed a unit, lesson or other learning task that used technology and implemented it in their classrooms.
6. The coordinator provided follow-up support by visiting the participant teachers' classrooms to continue the conversation and assist with both technology and implementation of the unit teachers developed (p. 90).

According to Yocam, the professional development model that he created was demonstrated to be successful, mainly due to its flexibility. Yocam indicated that while the principles provided a firm pedagogical foundation, each site required a different schedule and a different support arrangement. The model was also responsive to the needs of the participating teachers.

Yocam noted that the impact of the ACOT professional development model was most significant during the second and third years of the program. Teachers reported increased levels of technology use in their classrooms; novice users developed a greater comfort with the technology; participants made changes in how they organized their classrooms, their students for instruction, and in the strategies used; participants changed their attitudes toward teaching; school administrators began looking to the participants for assistance related to technology purchases; and participants became involved in writing grant proposals. Yocam's conclusion was that, for the ACOT program, change was personal and professional development had to change to become flexible and responsive.

The most successful approaches for technology infusion into the educational curriculum seem to be those that identify a small core of interested faculty who have a focused need matched to their particular teaching area of expertise. From this core of teachers, others are added with the original core becoming mentors for those that follow. This approach was used in this current study in developing the workshop method.

This literature review examined research in four broad areas: institutional uses of educational technology, anxiety related to the use of that technology, faculty concerns, and professional development.

The literature seems to indicate that many institutions are increasing their use of technology. Institutions seem to be concerned about how technology can be adopted and integrated into curricula, how the quality of instruction can be assessed, and how students can be engaged and included in the use of educational technology.

The research on anxiety about technology seems to indicate that students who have expectations of doing well do better than those who do not. The research also

seems to indicate that experience may be a factor in improved performance, but that finding is tempered by a discovery that some technology anxious students may use the technology when forced to but avoid it when possible and then stop using it as soon as they have concluded the immediate task at hand.

The literature about faculty concerns seems to indicate not only the presence of concerns about educational technology and other innovations, but also that the concerns transform over time.

Finally, there have been numerous approaches to professional development offered in the literature. The most successful approaches for technology infusion into the educational curriculum seem to be those that identify a small core of interested faculty who have a focused need matched to their particular teaching area of expertise. From this core of teachers, others are added with the original core becoming mentors for those that follow.

Chapter III

Methodology

Design

This study used a modification of the pretest-posttest control group as discussed in Gall, Borg, and Gall (1996). It was modified in that the control group was given the pretest but not the posttest of the SoC questionnaire. Since no randomization occurred, this study can be considered a modified quasi-experimental design as defined by Campbell and Stanley (1963). The experimental group was given both a pretest and a posttest. However, a small random sample of both groups was interviewed post-intervention using the Level of Use (LoU) interview format. This was considered a form of posttest only. The study design is shown in Table 1. In this type of design only selection is controlled. History, maturation, regression, testing, and mortality are uncontrolled. The major threat to external validity was the possible interaction of selection and the intervention. The LoU was used to help control for external validity. The LoU was designed to delve deeper

into each of the stages and to identify levels of use of the intervention.

Table 1

Study Design

Instrument	<u>Experimental Group</u>		<u>Control Group</u>	
	Pre	Post	Pre	Post
SoC	X	X	X	-
Technology Inventory	X	-	X	-
LoU	-	X	-	X

Note. Study instruments are the SoC (Stages of Concern questionnaire; technology inventory; and LoU (Level of Use interview). An X indicates an instrument was administered, a dash indicates it was not.

Limitations. Participants in both the experimental group and control group were elicited through a mailing conducted by the College soliciting volunteers. Three possible groups were expected: those who responded to the mailing, completed the instruments, and volunteered for the innovation; those who responded to the mailing, completed the instruments, but do not volunteer; and those who do not respond to the mailing. It was anticipated that some people would not respond for several reasons: they may be dispassionate about

professional development of any kind, they may already be well versed in the innovation and feel the training would be a waste of their time, they may fear the subject and wish to avoid it, or they may not be available to participate at the established time.

Since the study sought to discover something about anxiety and professional development as a mitigating force for that anxiety, not capturing anxiety-ridden people was of concern to the researcher. Anxiety-ridden people may also have populated the group of people who responded but did not volunteer, but that limitation was somewhat controlled for as this group, in fact, made up the control group. They completed and returned both the SoC and the Technology Inventory. A small random sample of that number was also interviewed at the end of the study using the LoU interview. A sample of the LoU interview is contained in Appendix C.

Lack of randomization was also a limitation of this study. Since volunteers were used, there was no true randomization of participants. However, the researcher did not see the data until after the intervention was completed and the interviews begun. This insured that any

one participant's level of anxiety would not influence the intervention.

Another limitation of the study was prior exposure to the innovation. The Technology Inventory was used to give the researcher an understanding about the extent of participants' prior learning and to help control for this limitation. A copy of the Technology Inventory is contained in Appendix B.

Participants

Population. The population for this study was comprised of all ranked teaching faculty, full-time and adjunct, in a small liberal arts college located in the Mid-Atlantic states. Faculty were 51% female, 49% male; 13% full-time, 87% adjunct. Teaching experience of faculty at the college was: more than 25 years (1%), 16-25 years (6%), 11-15 years (8%), 6-10 years (28%), 3-5 years (30%), and 1-2 years (27%). Ethnic background information was not available. From this population, participants self-selected for the study by returning the survey.

Background data. The background data of the participants are presented in Table 2. The participants in the control group (n=36) were largely male (66.67%),

most white (91.67%), and typically over the age of 51 (66.67%). Teaching experience was somewhat varied, but tended to be over 15 years (55.55%). All held graduate degrees, with 20 holding doctorates (55.56%). A large portion of this group taught in part-time adjunct positions (72.22%).

The participants in the experimental group were more evenly split by gender, but females were predominant (58.33%). The participants were largely white (83.33%) and somewhat younger than the participants in the control group (58.33% were under the age of 50). They also tended to have less teaching experience (29.17% had over 15 years) than the control group. Half of the experimental group participants held master's degrees while ten (41.67%) held doctorates and two (8.33%) held bachelor's degrees. A large portion held full-time teaching or administrative positions (87.50%).

Instrumentation

Concerns-Based Adoption Model (CBAM). Developed by Hall, George, and Rutherford (1986), the CBAM measures concerns toward an innovation. According to the authors (Hall, George, & Rutherford, 1986), concerns occur in a natural sequence, from curiosity about the innovation to

Table 2

Background Data of Participants

<u>Variable</u> <u>Experimental Group</u>	<u>Control Group</u>			
	n	%	n	%
<u>Age</u>				
31-40	0	0.00%	5	20.83%
41-50	12	33.33%	9	37.50%
>51	24	66.67%	10	41.67%
<u>Education</u>				
Bachelor	0	0.00%	2	8.33%
Master	16	44.44%	12	50.00%
Doctorate	20	55.56%	10	41.67%
<u>Ethnicity</u>				
Black, not Hispanic	0	0.00%	2	8.33%
Hispanic	2	5.56%	2	8.33%
Asian	0	0.00%	0	0.00%
American Indian	0	0.00%	0	0.00%
White, not Hispanic	33	91.67%	20	83.33%
Other	0	0.00%	0	0.00%
<u>Gender</u>				
Male	25	69.44%	10	41.67%
Female	11	30.56%	14	58.33%
<u>Experience</u>				
3-5 years	1	2.78%	2	8.33%
6-10 years	5	13.89%	11	45.83%
11-15 years	10	27.78%	4	16.67%
16-25 years	12	33.33%	6	25.00%
>25 years	8	22.22%	1	4.17%
<u>Position</u>				
Full-time faculty	9	25.00%	15	62.50%
Part-time faculty	26	72.22%	6	25.00%
Administrator	1	2.78%	3	12.50%

self-concerns, application concerns, and, finally, seeking improvement beyond the innovation. The authors of CBAM hold that people are the most important factor in the change process. CBAM is client-centered and considers the needs of the individuals in the change process. Thus, this instrument is based on the assumption that when participants are first exposed to an innovation, their concerns tend to be very self-oriented. Besides having to overcome some primary insecurities and anxieties, participants must engage in a process of acquiring an understanding of the innovation or rejecting it totally with little information. Once these concerns are accommodated, the participants become more concerned about managing the innovation in their teaching. Concerns center on how the innovation will affect their students, how they might work with others in a relationship with the innovation, and when best to use the innovation.

Hall, George, and Rutherford (1986) delineated seven stages of concern and anxiety reduction. These seven stages, as shown in Figure 2, range from absolute unawareness of the innovation to a complete understanding

Stage	Explanation
0	AWARENESS: Little concern about or involvement with the innovation is indicated.
1	INFORMATIONAL: A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about herself/himself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.
2	PERSONAL: Individual is uncertain about the demands of the innovation, her/his inadequacy to meet those demands, and her/his role with the innovation. This includes analysis of her/his role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.
3	MANAGEMENT: Attention is focused on the processes and tasks of using the innovation and best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.
4	CONSEQUENCE: Attention focuses on impact of the innovation on students in her/his immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.
5	COLLABORATION: The focus is on coordination and cooperation with others regarding use of the innovation.
6	REFOCUSING: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

Figure 2. Stages of Concern About the Innovation. From *Measuring Stages of Concern about the Innovation*, by G. E. Hall, A. A. George, and W. L. Rutherford, p. 7. Copyright 1986 by Southwest Educational Development Laboratory (SEDL). Used with permission.

of the innovation and a search for more powerful innovations.

A critical factor in the instrument's utility is expressed by the authors:

. . . higher level concerns development cannot simply be engineered by an outside agent. Holding concerns and changing concerns is a dynamic of the individual . . . But there is no guarantee that arousal of higher stage concerns will follow the reduction of lower stage concerns. Providing inputs that are not stage relevant (e.g., attempting to force high level concerns) is an assured way to increase the intensity of lower stage concerns. Whether or at what speed higher level concerns develop will depend on the person as well as the innovation and the environment (Hall, George, & Rutherford, 1986, p. 6).

Thus, according to the CBAM authors, some participants may opt out of the innovation, some may follow through the stages in a fairly linear fashion, and others may move forward only to fall back and dwell on lower level concerns before deciding to move forward or opt out.

The CBAM has two component instruments: the Stages of Concern About the Innovation questionnaire and the Levels of Use of the Innovation interview.

Stages of Concern About the Innovation According to the authors, this instrument was developed over a five year study period following research into what has become known as Concerns Theory. The instrument contains 35 questions, each requiring a response using an eight-point scale. Responses range from "not very much like me now" to "very much like me now". Respondents are asked to

reflect on the statement, make a judgment about how that statement fits with their basic beliefs at the moment of testing, and then quantify that feeling by indicating its strength along the continuum.

The instrument was modified for use in this study in two ways. A pilot study was conducted using 22 doctoral students as the participant base. Each pilot participant was asked to critique the instrument, and to make comments as to ease of use. An analysis of the results of the pilot study and the critique comments was conducted. The analysis uncovered that one particular response was confusing and confounding the results. It was removed. Additionally, the word "innovation" was changed in each response to indicate the type of innovation used in this study, which was educational technology. The researcher felt this improved the instrument's clarity and reduced possible internal validity concerns. An example of the SoC used in this study is contained in Appendix A.

Reliability. According to the authors, Hall, George, and Rutherford (1986), the CBAM instrument has high internal reliability. Table 2 shows the alpha coefficients of internal consistency for each of the seven Stages of Concern scales. As can be seen in Table

3, these coefficients are moderate to fairly strong. The lowest coefficient was related to Stage 0, Awareness, and the highest to Stage 2, Personal.

Table 3

Alpha Coefficients of Internal Consistency for the Stages of Concern Questionnaire, N = 830

Stage	0	1	2	3	4	5	6
Alphas	.64	.78	.83	.75	.76	.82	.71

Note: From Measuring Stages of Concern about the Innovation, by G. E. Hall, A. A. George, and W. L. Rutherford, p. 11. Copyright 1986 by Southwest Educational Development Laboratory (SEDL). Used with permission.

The authors used a generalization of the Kuder-Richardson Formula 20 for dichotomous items. The TESTAT on the VSTAT library (Veldman, 1967) was used to compute the coefficients for data from a stratified sample of 830 teachers and professors involved in a two-year longitudinal study.

Test-retest validity was also addressed. A sample of 171 individuals was asked to complete the SoC Questionnaire a second time, two weeks after they

completed the first questionnaire. A total of 132 people completed the retest. The correlations were computed and are presented in Table 4.

Table 4

Test-Retest Correlations on the Stages of Concern Questionnaire, N = 132

Stage	0	1	2	3	4	5	6
Pearson-r	.65	.86	.82	.81	.76	.84	.71

Note: From Measuring Stages of Concern about the Innovation, by G. E. Hall, A. A. George, and W. L. Rutherford, p. 11. Copyright 1986 by Southwest Educational Development Laboratory (SEDL). Used with permission.

Validity. The authors found that determining the instrument's validity was not as easy as determining its reliability. A series of validity studies were conducted, each successive one giving the authors increased confidence in their instrument. The most convincing validity argument comes from the authors' large collection of case studies. One such case involved the faculty of a single elementary school in a two-year longitudinal study. The faculty were tracked over the period during a teaming innovation. The teachers moved

from not teaming to establishing teaming as a routine. As hypothesized in the concerns theory, the faculty concerns shifted from being high on the lower stages (0, 1, 2) through a high on management concerns (3), to fairly low intensity in all stages.

In another case, the faculty at two urban elementary schools in Houston, Texas, were asked to participate in a five-week summer workshop on new approaches to reading. Approximately half of the faculty opted to attend. Both groups were given the SoC questionnaire before training began. The workshop group was given another SoC questionnaire at the completion of the training. The non-workshop faculty were given a one-day informational session on the new program just prior to the opening of school as part of the school's inservice program. They were given another SoC questionnaire at the completion of that session. Faculty who had been exposed to the workshop had higher scores on higher-level stages, such as Stage 5 (collaboration) and Stage 6 (refocusing). Those not in the workshop had higher lower-level Stage scores, such as Stage 0 (awareness), Stage 1 (informational), and Stage 2 (personal). All differences were significant beyond $p < .05$.

It appears from the data presented by the authors regarding the validity of their instrument, that it has moderate external validity. It has a long history with over 300 longitudinal studies of two or more year's duration.

Levels of Use of the Innovation Interview. This instrument is a focused interview which provides the interviewer with an interview guide consisting of a list of objectives and questions, but gives the interviewer latitude within the framework of the interview guide (Hall, George, & Rutherford, 1986). The authors used methods and procedures developed by Maccoby and Maccoby (1954) in devising the LoU. Maccoby and Maccoby noted that less structured interviews allow for standardization of meaning rather than relying on the same words to mean the same thing in every interview. They envisioned that every person interviewed would respond differently, and, that for the objectives of the interview to be met, follow-up questions had to be individualized. According to Hall, George, and Rutherford, the use of the LoU in the CBAM helps mitigate against errors produced by a self-report (in this case, the SoC). A number of questions are asked that differ in form and content, but

are related in a predicted meaningful and logical fashion. According to Maccoby and Maccoby (1954), a high correlation between responses, indicate that they tap a common characteristic of the respondent. The CBAM authors have found that long-time use of the LoU by over 200 major longitudinal studies indicates that responses to the LoU were highly correlated and, therefore, they assumed with some certainty that they measured what they purported to measure, which is Levels of Use of the Innovation.

The Technology Inventory. This instrument was developed by the researcher of the present study as a means of determining demographic information and as a means of obtaining information about the types and reported use of various types of educational, office, and personal technology. Faculty completing the instrument were also given an opportunity to indicate the amount, type, and formality of any technology training they had previously received. The Inventory was administered along with the CBAM SoC. Data were collected by the research assistant and given to the researcher in an aggregate manner.

Procedures

This study examined the research question in five phases: crafting of a professional development seminar; placing participants into designated experimental and control groups; conducting the professional development seminar; administering a posttest to the experimental group; conducting LoU interviews among a random sample of both the experimental and control groups.

Phase I: Crafting of a Professional Development Seminar. First, a flexible six-unit professional development seminar was developed. The researcher used the results obtained from the SoC and the Technology Inventory to craft the professional development intervention. The basic presentation design was adapted from a model designed by Oakley (1994) at the Center for Asynchronous Learning Environments, the University of Illinois at Urbana-Champaign. This model was designed to assist in anxiety reduction by first introducing the participants to the "culture of technology". The seminar series focused on "hands-on" technology, methods, curricula development, and technology modeling.

Phase II: Soliciting Volunteers for the Study.

Second, a pretest for the Stages of Concern Questionnaire

and the technology inventory were offered to all ranked full-time and adjunct faculty (n=115). A research assistant distributed and collected all invitations to participate, all SoC questionnaires, and all Technology Inventories. No names appeared on any of the instruments. They were coded and given to the researcher bundled by Control and Experimental Group with only numbers identifying individual participants. Selection for control and experimental group inclusion was made by the research assistant. In a cover letter that accompanied the SoC and Technology Inventory, all potential faculty participants were asked to volunteer for the professional development seminar. Those who elected not to participate were assigned to the Control Group (n=37). The volunteer names were placed on index cards by the research assistant who sorted the cards by academic division. This was done to assure relative participation equivalency among the teaching disciplines. The research assistant shuffled the cards in each division stack, turned them face down, and selected the top card from each of the five stacks. These names were placed in the Experimental Group. This process was continued until all cards were exhausted and the Experimental Group was formed (n=23). A

third group, comprised of people who did not respond, was not included in this study. An overview of the participants is contained in Table 5.

Table 5

Study Participation and Instruments

	Participants	Non- Participants	Non- respondents
<u>n</u>	24	36	55
Pretest	SoC TI	SoC TI	None
Posttest	SoC	None	None
Interview	LoU (n = 4)	LoU (n = 4)	None

Phase III: Conducting the Professional Development Seminar. The third phase involved the Experimental Group participating in the professional development seminar. The seminar consisted of six 1 hour and 45 minute sessions, each with a different topic. The seminar outline is shown in Figure 3.

<u>Unit</u>	<u>Topic</u>
One	Introduction to Educational Technology
Two	Curriculum Development for Technology
Three	Video Production
Four	Planning for Educational Technology
Five	Presentation Software
Six	Implementation of Educational Technology

Figure 3. Topical outline of the seminar.

Not all participants attended all seminar sessions. The attendance pattern is shown in Table 6.

Table 6

Attendance Statistics for Seminar

<u>Lesson</u>	<u>Attending #</u>	<u>Attending %</u>
One	23	96
Two	18	75
Three	17	71
Four	20	83
Five	10	42
Six	19	79

Note. Total number of seminar participants: 24

Phase IV: Administering a Posttest to the Experimental Group. The fourth phase consisted of a posttest for the Stages of Concern Questionnaire, which was administered to the Experimental Group. The posttest was an exact duplicate of the pretest SoC and was administered at the conclusion of the final session of the professional development seminar.

Phase V: Conducting LoU Interviews. In the fifth phase, the research assistant identified four random participants from each group for follow-up interviews. The names were given to the researcher. These interviews were conducted using models presented in the Open-ended Question Manual for the Concerns-Based Adoption Model (CBAM) of the University of Texas, as developed by Heck, Stiegelbauer, Hall, and Loucks (1996) and by Newlove and Hall (1976). An analysis of these questions was performed to help explain faculty concerns about educational technology and to determine a need for follow-up research. In accordance with the strategy outlined by the model, interviews were conducted until results were similar. Therefore, the researcher conducted four interviews from the Control Group and four interviews from the Experimental Group. Results were checked by a

second rater provided by the Southwest Educational Development Laboratory in Austin, Texas. Tapes and transcripts were sent to the second rater who provided an independent rating for each interview.

Data Analysis

The SoC data were reviewed using procedures outlined in the CBAM model. Each participant's responses were profiled to determine the pre-intervention stage of concern for each member of both the Control (n=24) and Experimental Groups (n=36). A similar posttest profile was constructed for each participant in the Experimental Group following the administration of the posttest (n=24). Pre and post profiles were compared, as were the profiles for the Control and Experimental groups.

The data from the Technology Inventory were also aggregated by group to determine demographic and other factors. A chi-square analysis was used to explain this data.

The data from the LoU interviews were placed in a matrix matched against eight levels of use and eight categories. The same was done by each rater. An example of the matrix is contained in Appendix D. The results of

this analysis produced a profile for each interviewed participant.

Chapter IV

Results

This chapter presents the findings for each of the two questions considered in this study. The first question was, "What is the effect of a professional development program on faculty concerns about technology?" The second question was, "To what extent are the faculty using educational technology in their classrooms?"

In order to attempt to answer the two research questions, two types of results are presented: statistical and clinical. The statistical results were compiled from a Pearson Chi-square analysis of results obtained from the Technology Inventory and from independent t-tests on the percentile scores from the Stages of Concern Questionnaire. The clinical results were obtained through a clinical interpretation of the Stages of Concern Questionnaire and the Level of Use Interviews.

Technology Inventory Results

Knowledge and Use of Technology. Participants were asked about their knowledge and use of selected

technology as part of the Technology Inventory. The results are presented in Table 7. Slightly over half of the participants (52.78%) in the control group expressed "some to extensive" knowledge of the Internet, while a large portion of the control group (72.22%) expressed "some to extensive" knowledge of e-mail. Although a similar percentage of the control group participants expressed "some to extensive" access to the Internet (53.78%), more reported having access to e-mail (80.56%). However, most reported "none to little" demand for their students to use the Internet (75%) or e-mail (80.56%). A large portion of the control group participants reported using video in their classrooms (61.11%).

A large portion of the participants in the experimental group reported "some to extensive" knowledge of the Internet (62.50%) and e-mail (70.83%). A large portion of them also reported "some to extensive" access to the Internet (70.83%) and e-mail (70.83%). However, many of them reported "none to little" demand for their students to use the Internet (66.67%) or e-mail (70.83%). Most participants in the experimental group reported using video in their classrooms (70.83%).

Table 7

Knowledge and Use of Technology

Variable	Control Group		Experimental Group	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Knowledge of Internet				
None to little	17	47.22%	9	37.50%
Some to extensive	19	52.78%	15	62.50%
Knowledge of E-mail				
None to little	10	27.78%	7	29.17%
Some to extensive	26	72.22%	17	70.83%
Accessing Internet				
None to little	17	47.22%	7	29.17%
Some to extensive	19	52.78%	17	70.83%
Using e-mail				
None to little	7	19.44%	7	29.17%
Some to extensive	29	80.56%	17	70.83%
Using video				
None to little	14	38.89%	7	29.17%
Some to extensive	22	61.11%	17	70.83%
Requiring students to use Internet				
None to little	27	75.00%	16	66.67%
Some to extensive	9	25.00%	8	33.33%
Contacting students Via E-mail				
None to little	29	80.56%	17	70.83%
Some to extensive	7	19.44%	7	29.17%

Knowledge and use of selected consumer technology.

Participants were asked about their knowledge and use of selected consumer technology as part of the Technology Inventory. The results are presented in Table 8. All (100%) of the control group participants reported "some to extensive" use of the telephone, and large portions of that group also reported "some to extensive" use of television (80.56%), VCRs (83.33%), cameras (66.67%), fax machines (69.44%), computers (91.67%), answering machines (88.89%), and voice mail (75%). However, smaller portions reported "some to extensive" use of camcorders (30.56%), video games (25%) and slide projectors (13.89%):

All participants in the experimental group also reported "some to extensive" use of the telephone (100%). Experimental group participants also reported "some to extensive" use of television (87.50%), VCRs (87.50%), fax machines (70.83%), computers (95.83%), answering machines (91.67%), and voice mail (79.17%). Only half (50%) reported "some to extensive" use of cameras. Smaller portions of the experimental group reported "some to extensive" use of camcorders (45.83%), video games (12.50%), and slide projectors (12.50%).

Table 8

Use of Selected Consumer Technology

Variable	Control Group		Experimental Group	
	n	%	n	%
TV				
None to little	7	19.44%	3	12.50%
Some to extensive	29	80.56%	21	87.50%
VCR				
None to little	6	16.67%	3	12.50%
Some to extensive	30	83.33%	21	87.50%
Camera				
None to little	12	33.33%	12	50.00%
Some to extensive	24	66.67%	12	50.00%
Camcorder				
None to little	25	69.44%	13	54.17%
Some to extensive	11	30.56%	11	45.83%
Telephone				
None to little	0	0.00%	0	0.00%
Some to extensive	36	100.00%	24	100.00%
Fax Machine				
None to little	11	30.56%	7	29.17%
Some to extensive	25	69.44%	17	70.83%
Computer				
None to little	3	8.33%	1	4.17%
Some to extensive	33	91.67%	23	95.83%
Video Games				
None to little	27	75.00%	21	87.50%
Some to extensive	9	25.00%	3	12.50%
Slide Projector				
None to little	31	86.11%	21	87.50%
Some to extensive	5	13.89%	3	12.50%
Answering Machine				
None to little	4	11.11%	2	8.33%
Some to extensive	32	88.89%	22	91.67%
Voice Mail				
None to little	9	25.00%	5	20.83%
Some to extensive	27	75.00%	19	79.17%

Use of selected educational technology. Participants were asked about their knowledge and use of selected

educational technology as part of the Technology Inventory. The results are presented in Table 9. Relative to the use of the educational technology surveyed in the

Table 9

Use of Selected Educational Technology

Variable	Control Group		Experimental Group	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Word processing				
None to little	5	13.89%	4	16.67%
Some to extensive	31	86.11%	20	83.33%
Spreadsheet				
None to little	21	58.33%	15	62.50%
Some to extensive	15	41.67%	9	37.50%
Presentation software				
None to little	26	72.22%	14	58.33%
Some to extensive	10	27.78%	10	41.67%
Computer-generated tests				
None to little	28	77.78%	17	70.83%
Some to extensive	8	22.22%	7	29.17%
Computer grade books				
None to little	31	86.11%	22	91.67%
Some to extensive	5	13.89%	2	8.33%
Internet search engine				
None to little	18	50.00%	11	45.83%
Some to extensive	18	50.00%	13	54.17%
Computer-assisted graphing				
None to little	28	77.78%	18	75.00%
Some to extensive	8	22.22%	6	25.00%
Programming languages				
None to little	30	83.33%	21	87.50%
Some to extensive	6	16.67%	3	12.50%

Technology Inventory, only word processing was reported by a large portion of the participants in the control group as receiving "some to extensive" use (86.11%). Half (50%) reported some to extensive use of Internet search engines, and less than half (41.67%) reported some to extensive use of spreadsheets. Few members of the control group reported "some to extensive" use of presentation software such as PowerPoint (27.78%), computer-generated tests (22.22%), computer grade books (13.89%), computer-assisted graphing (22.22%), and computer programming languages (16.67%).

Many of the participants in the experimental group also reported "some to extensive" use of word processing (83.33%) and Internet search engines (54.17%). This represented a larger percentage of the experimental group who reported using Internet search engines than was true for the control group. Participants in the experimental group also reported a much higher use of presentation software than did the control group. Of the experimental group, 41.67% reported "some to extensive" use. Approximately a third (37.50%) of the experimental group reported using spreadsheets, whereas, 41.67% of the

control group did so. Twenty percent or fewer of the experimental group reported "some or extensive" use of computer-generated tests (29.17%), computer grade books (8.33%), computer-assisted graphing (25%), and computer programming languages (12.50%).

Contact with students. Participants were asked about how they maintained contact with their students about academic issues. The results are presented in Table 10. Many of the participants in the control group reported "some to extensive" contact before and after class (97.22%) and by telephone (83.33%). Less than half reported maintaining contact during office hours (44.44%). A few members of the group reported "some to extensive" contact by fax (27.78%), e-mail (19.44%), by regular mail (36.11%), and by computer (8.33%).

All (100%) of the participants in the experimental group reported "some to extensive" contact with students before and after class. Many of the experimental group also reported "some to extensive" contact with students during office hours (87.50%) and by telephone (91.67%). Some reported some to extensive contact with their students by fax (33.33%), e-mail (29.17%), regular mail (33.33%), and by computer (12.50%).

Table 10

Contact With Students

Variable	<u>Control Group</u>		<u>Experimental Group</u>	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Before/After Class				
None to little	1	2.78%	0	0.00%
Some to extensive	35	97.22%	24	100.00%
During Office Hours				
None to little	20	55.56%	3	12.50%
Some to extensive	16	44.44%	21	87.50%
By Phone				
None to little	6	16.67%	2	8.33%
Some to extensive	30	83.33%	22	91.67%
By Fax				
None to little	26	72.22%	16	66.67%
Some to extensive	10	27.78%	8	33.33%
By E-Mail				
None to little	29	80.56%	17	70.83%
Some to extensive	7	19.44%	7	29.17%
By Regular Mail				
None to little	23	63.89%	16	66.67%
Some to extensive	13	36.11%	8	33.33%
By Computer				
None to little	33	91.67%	21	87.50%
Some to extensive	3	8.33%	3	12.50%

Interactions. A Chi-square analysis was conducted to determine if any significant interactions existed between and among variables presented in the Technology Inventory. The results are presented in Table 11. Six

Table 11

Summary of Chi-square Analysis for Group Differences at the Start of the Study

Variable	χ^2	df	p-value
Age	6.851	2	0.033*
Education	3.746	2	0.154*
Ethnicity	5.127	4	0.274*
Gender	3.050	1	0.081
Experience	9.950	4	0.041*
Position	16.096	2	0.000*
Knowledge of Internet	0.708	1	0.400
Knowledge of E-mail	0.002	1	0.960
Accessing Internet	2.222	1	0.136
Accessing E-mail	0.661	1	0.416
Use of video	0.001	1	0.978
Requiring students to use Internet	0.086	1	0.770
Requiring students to use E-mail	1.198	1	0.274
Use of TV	0.569	1	0.451*
Use of VCR	0.237	1	0.626*
Use of Camera	0.798	1	0.372
Use of Camcorder	1.263	1	0.261
Use of fax	0.002	1	0.960
Use of computer	0.968	1	0.325*
Use of video games	1.007	1	0.316*
Use of slide projector	0.039	1	0.844*
Use of answering machine	0.241	1	0.624*
Use of voice mail	1.534	1	0.215*
Use of word processing	0.062	1	0.803*
Use of spreadsheets	0.393	1	0.531
Use of presentation software	0.520	1	0.471
Use of computerized tests	2.206	1	0.137
Use of computer grade books	0.482	1	0.487*
Use of CAD	0.012	1	0.649
Use of programming languages	0.039	1	0.844*
Before and after class	0.437	1	0.509*
During office hours	11.929	1	0.001
By phone	0.943	1	0.332*
By fax	0.933	1	0.334
By E-mail	0.152	1	0.696
By regular mail	0.086	1	0.770
By computer	54.971	2	0.000*

Note. * indicates significance suspect; variable that are in bold print are statistically significant.

interactions were significant at .05 level; however, in four of the variables the data were too sparse, rendering the significance suspect. Those four variables were "age" ($p=0.033$), "experience" ($p=0.041$), "position" ($p=0.000$), and "contacting students via computer" ($p=0.000$). The two variables that remained significant were "gender" ($p=0.081$) and "contacting students during office hours" ($p=0.001$). The experimental group consisted of mainly females and the control group males. The experimental group consisted of mainly full-time staff, while the control group consisted of mainly part-time staff. Full time staff would be expected to maintain office hours, while the part-time staff would not. Therefore, the two groups appear to be similar with those few exceptions.

Stages of Concern Profiles

All participants in both the control and experimental groups completed the Stages of Concern (SoC) questionnaire prior to the intervention. Participants in the experimental group also completed the questionnaire post-intervention. The results are reported in percentile scores.

Concerns. Prior to the intervention, when compared with the experimental group, the control group expressed

more concerns about personal issues such as compensation and training, as well as concerns about the importance of educational technology as a concept. The experimental group expressed concerns that were largely informational. This group was more concerned about getting additional information about how educational technology would fit into the college culture as well as their classrooms, what was involved, and what was to be learned. A percentile score profile for the pretest for both the control and experimental groups is presented in Figure 4.

In the posttest SoC, the experimental group expressed concerns that had moved from the informational to the personal and management areas. A comparison of the experimental group's pretests and posttest SoC profiles is presented in Figure 5.

Individual SoC Profiles and Clinical Interpretation.

A clinical evaluation of individual SoC percentile scores was conducted. The results are contained in Table 13 (control group), Table 14 (experimental group pretest), and Table 14 (experimental group posttest). The scores are listed for each individual; however, no specific individual is identified. The columns listed under the

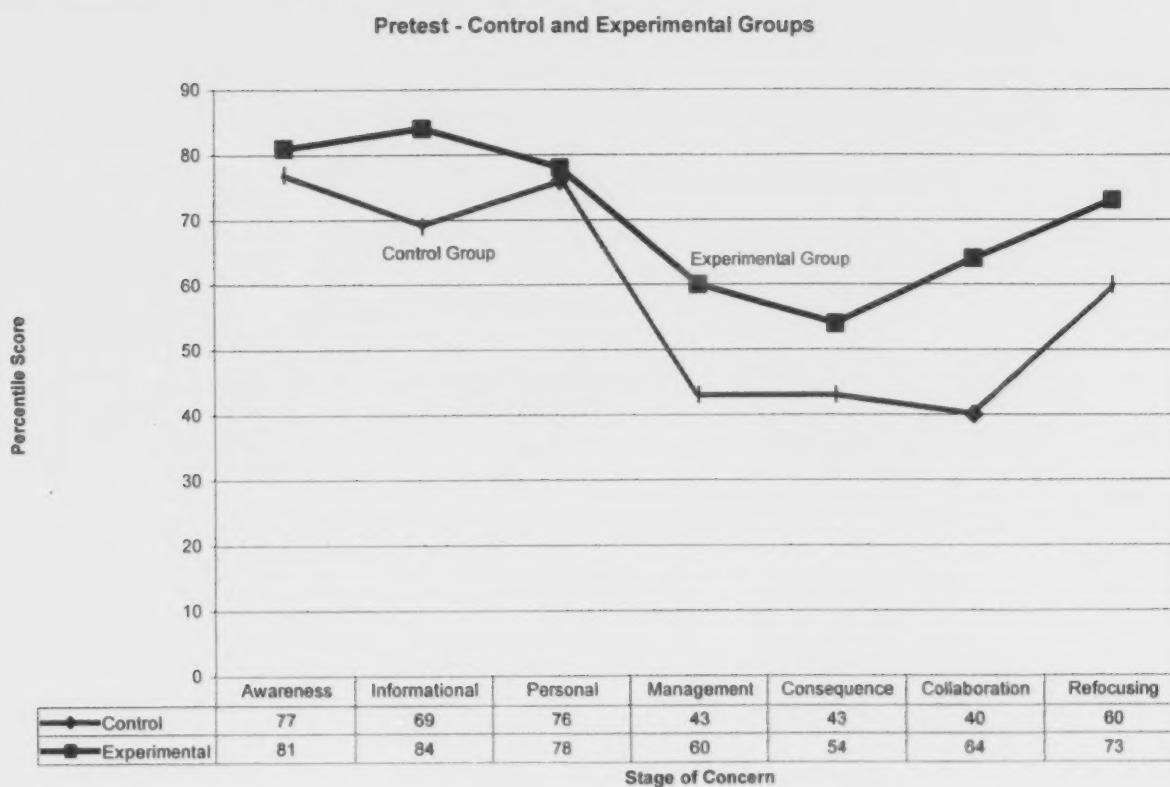


Figure 4. A comparison of the pretest percentile scores on the Stages of Concern questionnaire for the control (n=36) and experimental (n=24) groups.

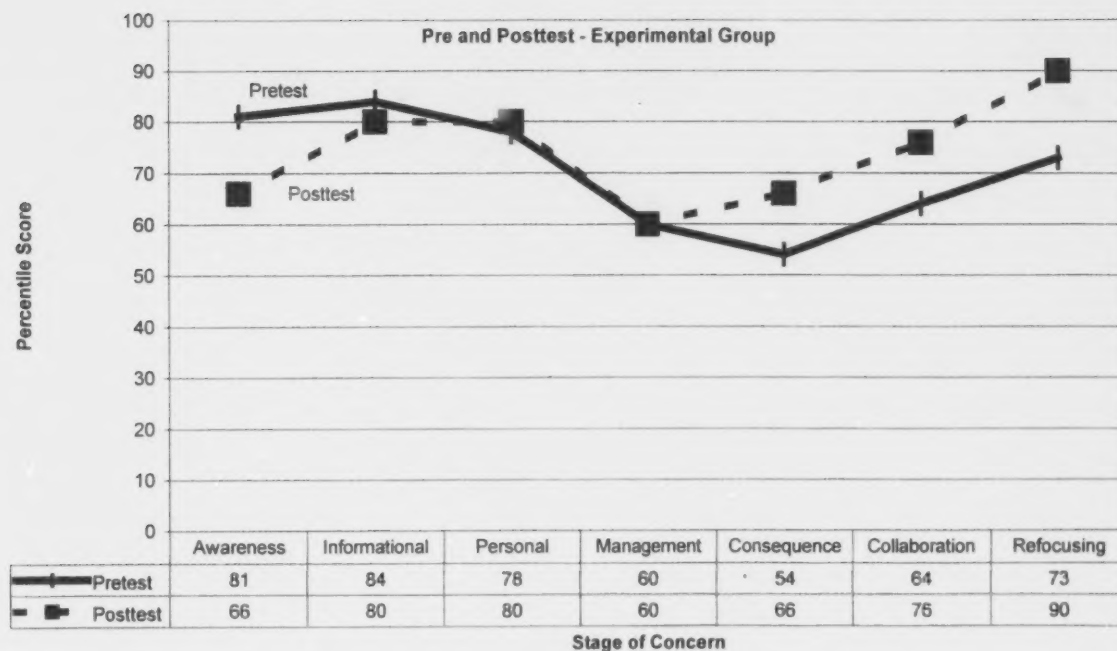


Figure 5. A comparison of pretest and posttest percentile scores on the Stages of Concern questionnaire for the experimental group (n=24 pretest, n=13 posttest).

Stages of Concern/Percentile Scores list each stage and the individual score for each participant. In the column under each stage is listed the individual SoC percentile score for that stage for each participant. The interpretation of these scores was derived from a clinical evaluation of the high scores for the individual plus the next highest score or scores for that

individual. The Comments column shows the clinical interpretation of those scores. As can be observed in Table 12 in the comments column, the control group (n=36) had 12 participants who demonstrated a lack of concern about educational technology; 10 with personal, status, and reward concerns; 2 that wanted more information; 2 that had ideas about how to facilitate teaching in another manner and could be holding negative views about educational technology; and 10 with higher level concerns that ranged from collaboration concerns to intense use of educational technology. As can be observed in Table 13 in the comments column, in their pretest, the experimental group (n=24) had no one who had a lack of concern about educational technology; 8 who wanted more information; 6 who had intense personal concerns about management, time, and rewards; 3 who had logistical concerns; and 7 who had other concerns that ranged from informational to the consequences of educational technology in the classroom. Only 13 participants of the experimental group completed the posttest. As can be observed in Table 14, their posttest concerns differed from the pretest concerns. In the posttest, 6 were concerned about moving beyond simple

Table 12

Individual SoC Percentile Scores for the Control Group (n=36)

Case	SoC Stages							Comments
	0	1	2	3	4	5	6	
1	81	75	83	<u>90</u>	24	31	60	Concerned about management, time, logistics
2	10	75	<u>87</u>	80	63	55	73	Has personal, status, and reward concerns
3	<u>72</u>	45	57	43	16	16	30	Lack of concern about Educational Technology
4	<u>99</u>	84	85	69	59	14	81	Lack of concern about Educational Technology
5	72	69	76	65	<u>82</u>	44	73	Concerned about consequences, effect of Educational Technology on individual
6	60	66	<u>87</u>	39	63	22	26	Has personal, status, and reward concerns
7	72	80	87	<u>94</u>	59	59	81	Concerned about management, time, logistics
8	53	48	57	18	21	<u>72</u>	57	Concerned about collaboration, development of curriculum
9	<u>91</u>	72	67	77	43	52	81	Lack of concern about Educational Technology
10	37	90	<u>95</u>	52	43	52	92	Has personal, status, and reward concerns
11	77	<u>91</u>	55	15	54	16	47	Wants more information about Educational Technology
12	29	<u>95</u>	83	15	86	<u>98</u>	92	Suggests high involvement with Educational Technology
13	<u>99</u>	88	70	11	66	16	17	High interest in Educational Technology, low resistance
14	66	<u>91</u>	83	56	86	<u>93</u>	87	Has concerns about looking to others for ideas, desires to learn from what others know and do
15	66	<u>91</u>	<u>89</u>	60	43	84	84	Has intense personal interest in Educational Technology
16	<u>81</u>	66	48	30	33	25	26	Lack of concern about Educational Technology
17	86	84	<u>91</u>	<u>90</u>	48	25	65	Has intense personal concerns about management, time, and rewards associated with EdTech
18	<u>89</u>	51	57	43	21	19	34	Lack of concern about Educational Technology
19	<u>60</u>	43	35	30	5	10	14	Lack of concern about Educational Technology
20	<u>77</u>	48	55	18	27	19	34	Lack of concern about Educational Technology
21	46	91	89	15	<u>96</u>	72	<u>99</u>	Has concerns about the consequences of EdTech for students, searching for other paths
22	<u>81</u>	72	78	23	30	25	38	Lack of concern about Educational Technology
23	<u>89</u>	63	57	52	33	52	52	Lack of concern about Educational Technology
24	84	57	<u>89</u>	11	16	9	22	Has personal, status, and reward concerns
25	<u>81</u>	37	57	39	43	19	30	Lack of concern about Educational Technology
26	81	88	57	34	43	25	<u>92</u>	Wants more information about Educational Technology
27	84	<u>95</u>	<u>96</u>	52	<u>96</u>	68	92	Has intense feelings about EdTech, isn't sure if use will fit with existing teaching events
28	<u>66</u>	48	28	27	15	3	22	Lack of concern about Educational Technology
29	60	72	78	18	<u>90</u>	84	<u>90</u>	Has ideas about how to do things differently, likely to be negative about Educational Technology
30	77	88	<u>96</u>	65	54	84	42	Has personal, status, and reward concerns
31	72	48	52	47	33	14	<u>81</u>	Has ideas about how to do things differently, likely to be negative about Educational Technology
32	<u>94</u>	84	89	77	86	59	73	Lack of concern about Educational Technology
33	89	93	<u>96</u>	69	86	80	90	Has personal, status, and reward concerns
34	37	63	<u>76</u>	39	33	25	47	Has personal, status, and reward concerns
35	53	63	<u>78</u>	52	30	22	57	Has personal, status, and reward concerns
36	60	80	<u>94</u>	34	59	72	57	Has personal, status, and reward concerns

Note. Bold and underlined numbers indicate highest percentile scores for a case. For instances where more than one cell is in bold for a case, the relationship between multiple stages was factored into the final clinical interpretation.

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Table 13

Individual Pretest SoC Percentile Scores for the Experimental Group
(n=24)

Case	SoC Stages							Comments
	0	1	2	3	4	5	6	
1	46	<u>75</u>	<u>76</u>	65	63	59	73	Has intense personal interest in Educational Technology
2	<u>86</u>	72	31	60	76	59	47	Wants more information about Educational Technology
3	77	<u>95</u>	<u>95</u>	30	76	55	57	Has intense personal interest in Educational Technology
4	81	88	92	<u>97</u>	54	84	90	Has intense personal concerns about management, time, and rewards associated with EdTech
5	81	<u>88</u>	85	43	82	72	<u>87</u>	Positive about Educational Technology, but has many logistical concerns
6	77	75	87	47	59	31	<u>92</u>	Positive about Educational Technology, but has many logistical concerns
7	10	<u>80</u>	70	47	19	52	60	Wants more information about Educational Technology
8	<u>89</u>	<u>88</u>	70	34	54	22	60	Has intense personal need to discover more about Educational Technology
9	<u>81</u>	48	31	65	11	64	17	Wants more information about Educational Technology
10	77	72	76	52	59	<u>95</u>	81	Positive about Educational Technology, but has many logistical concerns
11	84	<u>95</u>	55	23	86	55	92	Has intense personal interest in Educational Technology
12	81	<u>88</u>	76	52	63	40	69	Wants more information about Educational Technology
13	<u>94</u>	69	70	43	30	48	47	Wants more information about Educational Technology
14	<u>96</u>	<u>95</u>	91	56	14	48	69	Has intense personal need to discover more about Educational Technology
15	72	66	<u>89</u>	43	54	52	<u>87</u>	Has intense personal concerns about management, time, and rewards associated with EdTech
16	66	<u>80</u>	70	77	30	44	69	Wants more information about Educational Technology
17	<u>84</u>	<u>84</u>	76	69	48	68	69	Wants more information about Educational Technology
18	46	69	<u>87</u>	47	63	59	<u>87</u>	Has intense personal concerns about management, time, and rewards associated with EdTech
19	<u>81</u>	66	45	77	66	36	65	Wants more information about Educational Technology
20	81	<u>95</u>	92	77	71	<u>98</u>	92	Has concerns about looking to others for ideas, desires to learn from what others know and do
21	<u>96</u>	<u>93</u>	<u>95</u>	60	54	64	92	Has intense personal concerns about management, time, and rewards associated with EdTech
22	84	80	78	<u>88</u>	71	52	73	Has intense personal concerns about management, time, and rewards associated with EdTech
23	81	88	83	94	82	<u>98</u>	90	Has concerns about the consequences of EdTech for students, searching for other paths
24	46	95	<u>99</u>	9	71	<u>98</u>	92	Has intense personal concerns about management, time, and rewards associated with EdTech

Note. Bold and underlined numbers indicate highest percentile scores for a case. For instances where more than one cell is in bold for a case, the relationship between multiple stages was factored into the final clinical interpretation.

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Table 14

Individual Posttest SoC Percentile Scores for the Experimental Group
(n=24)

Case	Soc Stages							Comments
	0	1	2	3	4	5	6	
2	<u>99</u>	<u>90</u>	63	69	<u>90</u>	25	65	Has concerns about looking to others for ideas, desires to learn from what others know and do
5	23	<u>88</u>	48	39	63	68	77	Has concerns about looking to others for ideas, desires to learn from what others know and do
7	53	51	67	60	48	68	<u>81</u>	May be concerned about moving beyond simple Educational Technology applications
12	10	80	92	80	90	80	<u>96</u>	Has concerns about looking to others for ideas, desires to learn from what others know and do
14	<u>60</u>	48	48	52	19	64	<u>60</u>	A generally less intense concern about Educational Technology, undecided
15	66	93	95	73	82	76	<u>98</u>	May be concerned about moving beyond simple Educational Technology applications
16	29	75	70	65	71	76	<u>99</u>	May be concerned about moving beyond simple Educational Technology applications
17	77	80	70	56	66	<u>95</u>	87	May be concerned about moving beyond simple Educational Technology applications
18	53	84	92	73	92	<u>97</u>	<u>96</u>	Has intense personal concerns about management, time, and rewards associated with EdTech
21	84	91	<u>95</u>	47	76	55	90	Has intense personal concerns about management, time, and rewards associated with EdTech
22	86	69	72	30	43	76	<u>90</u>	May be concerned about moving beyond simple Educational Technology applications
23	60	72	76	73	63	84	<u>90</u>	May be concerned about moving beyond simple Educational Technology applications
24	84	95	<u>99</u>	47	71	<u>98</u>	<u>99</u>	Has concerns about looking to others for ideas, desires to learn from what others know and do

Note. Bold and underlined numbers indicate highest percentile scores for a case. For instances where more than one cell is in bold for a case, the relationship between multiple stages was factored into the final clinical interpretation.

educational technology applications; 4 had concerns about looking to others for help, collaboration, and guidance; 2 who had intense personal concerns about management, time, and rewards; and only 1 who had a less intense concern about educational technology.

A comparison of Tables 13 and 14 demonstrate that 12 of the 13 members of the experimental group who completed the posttest showed movement from lower level stages of concern to higher levels. For example, case number 7 showed movement from an informational stage (Stage 1) to a refocusing level (Stage 6).

Independent t-test

In order to determine if the two groups, control and experimental, were comprised of similar responses, an independent t-test was conducted on the individual percentile scores. In other words, were the control group responses significantly different from those of the experimental group? The independent t-test results tend to indicate that the difference in the responses of the two groups were statistically significantly different ($p=0.007$). The results are presented in Table 15.

Table 15

Pretest SoC Comparison Between Experimental and Control Groups

	Experimental	Control	<u>t</u>	<u>p</u>
<u>M</u>	79.875	65.222	-2.776	0.007
<u>SD</u>	14.727	26.034		
<u>n</u>	24	36		

Note. Independent two tailed t-test was performed.

Level of Use Results

The LoU interviews were conducted post-intervention with a sampling from both the control and experimental groups. Four participants from each group were interviewed. Their results are presented in Table 16 (control group) and Table 17 (experimental group). The category column lists eight levels of use of educational technology. Each of the columns under the heading of participants shows the type of use at each level for each participant. The control group had two interviewees who were orienting themselves to educational technology and preparing for its use in their classrooms. Two others expressed interest and were teaching using educational technology; one was integrating some advanced of technology with curricular materials. No one reported sharing information or ideas, conducting formal planning, or documenting their progress.

The experimental group responses were more varied than those in the control group. Two participants were already refining their knowledge, others were mechanically acquiring information and routinely sharing the information and ideas they obtained. The experimental

Table 16

Individual LoU Category Ratings and Overall LoU Ratings
for the Control Group

Category	Participants			
	1	2	3	4
Knowledge	I	I	IVB	V
Acquiring Information	II	III	IVA	V
Sharing	I	I	I	IVA
Assessing	I	ND	I	II
Control Planning	ND	ND	ND	III
Status Reporting	ND	ND	ND	ND
Performing	III	III	IVB	III
Overall Rating	II	II	IVA	III

Note. Roman numerals are as follows: I = Orientation, II = Preparation, III = Mechanical Level of Use, IVA = Routine Level of Use, IVB = Refinement Level of Use. The notation ND = Not Doing.

group was also doing some preparing to perform assessments of their work. All four were using educational technology in their classrooms. No one was planning in a formal sense or reporting on the status of their work.

Table 17

Individual LoU Category Ratings and Overall LoU Ratings
for the Experimental Group

Category	Participants			
	1	2	3	4
Knowledge	III	IVB	IVB	II
Acquiring Information	III	III	IVA	II
Sharing	IVA	IVA	IVA	II
Assessing	II	II	II	II
Control Planning	III	ND	ND	ND
Status Reporting	ND	ND	ND	ND
Performing	III	IVA	IVA	III
Overall Rating	III	III	IVA	II

Note. Roman numerals are as follows: I = Orientation, II = Preparation, III = Mechanical Level of Use, IVA = Routine Level of Use, IVB = Refinement Level of Use. The notation ND = Not Doing.

Comments from the interviews. As part of the LoU interview process, participants were asked to comment on their use of educational technology, problems they perceived in using educational technology, and other concerns they had with educational technology.

The control group interviews had a central theme of concern about personal issues such as time, support, compensation, and reward. One interviewee reported, "I would like to use the technology, especially video and PowerPoint. But what's to keep the college from using my material without compensating me for it? If I produce a course that has a lot of PowerPoint, several videos, and other materials, do they need me? After all, I'm only part-time." Another control group participant reported, "How is this going to impact my students? What about those who don't have this [technology] at home? Will the college require all students to take a computer course before they can take the regular classes?"

An experimental group participant reported, "Will I get the time I need at work to convert my courses to the new technology? Or will they just add this on to all my other [duties]?" A second experimental group participant reported, "I am excited about this new [technology]. I would like to work with other teachers to come up with ways to convert our regular material and to come up with new ways to teach." A third experimental group participant reported, "I can finally find a way to say something only once. I can get it into a technology

format that will allow my students to check the answers out anytime they need to without asking the same questions over and over again."

The responses from the control group expressed concerns about rewards, compensation, and other personal issues. In those instances where they mentioned using the technology, they were clear to point out that all of this was done on their own time, that they "owned it", and didn't feel they would get recognition or compensation for it if they revealed their innovative techniques.

The responses from the experimental group also expressed concerns about rewards, compensation, and other personal issues, but they were not as intense as were the concerns reported in the control group. Experimental group participants expressed a need to collaborate on development and use.

Summary

The statistical and clinical results of this study tend to indicate that faculty concerns about implementing technology did change after participating in a workshop on using technology in their courses as measured by the Stages of Concern questionnaire. Therefore, the first null hypothesis was rejected and the first alternative

hypothesis was accepted. Secondly, the results tend to indicate that faculty were using technology in their curriculum. Therefore, the second null hypothesis was also rejected and the second alternative hypothesis was accepted.

Chapter V

Discussion

This study examined two questions dealing with the effect of a professional development program on faculty concerns and the extent to which the faculty used educational technology in their classrooms. This chapter discusses the researcher's findings related to the questions posed by the study. The discussion includes generalizability, limitations, and recommendations.

Question 1

The first question was "What is the effect of a professional development program on faculty concerns about technology?"

Based on the data, the workshop appears to have had a positive influence on faculty concerns about technology. Faculty concerns in the experimental group changed from awareness and informational (Stages 0 and 1) to informational, personal, and refocusing (Stages 1, 2, and 6). The movement seemed to demonstrate that concerns changed from finding out about educational technology to finding out how educational technology was going to affect their teaching, their positions, their classroom

climate, and their compensation. The concerns about refocusing seemed to reflect a desire on the part of some experimental group participants to move beyond mere routine application of technology into ways of integrating educational technology into their curriculum.

Question 2

The second question was "To what extent are the faculty using educational technology in their classrooms?"

The results of the LoU seemed to indicate that faculty in the experimental group were using educational technology in their curriculum. Faculty reported a desire to collaborate with other faculty to develop new uses for the technology, share ideas, and share what they perceived to be a heavy work load. Some of the experimental group members were already doing just that. Several reported they were meeting weekly over lunch to share ideas. Two others used their new-found skills to present a faculty inservice to all full and part time faculty. One faculty member produced a video tape to cover lectures that students had missed when the weather had forced cancellation of classes. Two faculty members

reported they were developing study guides that could be used to assist students learning in telecourses.

Reports from the LoU interviews tended to confirm faculty use of educational technology. Faculty use ranged from preparation to use of the technology to mechanical use, to routine use. Sharing information was reported as being routine by all four participants who were interviewed. They reported their technology-related knowledge levels as being anywhere from preparation to routine gathering of information to refinement of information gathered.

Technology Inventory

In the Technology Inventory, faculty reported "none to little" use of software considered basic to the introduction of educational technology into the curriculum, such as: presentation software and spreadsheets. In their LoU interviews, faculty reported using, at some level, all of the technology elements presented in the workshop, including presentation software, spreadsheet software, video, and planning strategies.

Generalizability

This study focused on a group of self-selected faculty who seemed to be ready to learn something about educational technology. Further, the participants in this study were faculty in a small liberal arts college. Therefore, the external validity is questionable, and, as suggested by Patton (1994), the usefulness of the study's findings should be determined by the consumer of the research. The study provided participants' backgrounds that can be reviewed to determine appropriateness for generalizing findings and conclusions to other situations.

This study does not claim that the findings were all inclusive and reflected all faculty concerns about educational technology. Faculty in the experimental group were at various stages of concern as expressed in the Stages of Concern questionnaire. They were largely female, holders of doctorates or master's degrees with additional credits, and full-time. The impact of professional development on other groups is unknown and can not be inferred from the results of this study.

Limitations

The research methods used in this study were both descriptive and quasi-experimental in nature. Additionally, clinical interpretations were used to determine many of the findings. The descriptive methods used included the SoC questionnaire, the Technology Inventory, and the LoU interview. The quasi-experimental methods included the use of inferential statistical techniques, t-test for independent sample, and Chi-square analysis with a self-selected control and experimental groups. Therefore, there are several limitations that should be noted with regard to research design, participant selection, instrumentation, and researcher and participant bias.

Merriam and Simpson (1995) suggested that the major limitation of a descriptive design is the lack of the ability to predict results. They further explained that research often describes what is happening but is unable to generalize it to other situations. Reporting and analyzing in descriptive research, as noted by Merriam and Simpson, may be confusing or frustrating for other researchers. Therefore, the descriptive research methods

used in this study may have provided findings that are considered complex and unclear.

The quasi-experimental design used in this study accommodated a group of participants that were self-selected. Therefore, the results should be accepted as a description of the participants' concerns and uses of educational technology. The volunteer participants may have had a clear sense of purpose that influenced their use of educational technology.

The major limitation in the selected instruments was validity; that is, did the instruments measure what they intended to measure? In order to control for this, the researcher selected two of the three instruments (the SoC and the LoU) which had been used previously in hundreds of innovations in many educational situations. Additionally, two of the instruments (the SoC and the Technology Inventory) were pre-tested for relevance, readability, and understanding by a group of 21 doctoral students at the same college at which the participants were employed. However, there is the possibility that the respondents may have interpreted the items differently than what was intended.

Another major limitation that must be considered when reviewing the study's findings is researcher and participant bias. In this study, the researcher also served as the professional development facilitator. Since the workshop was confounded with the participation of the researcher, the question remains "Was the professional development seminar or the perception of the instructor the agent of change?" Positive responses on the posttest SoC and during the LoU interviews may have been the result of positive feelings towards the researcher at the conclusion of the workshop. This confounding role may have affected the researcher's interpretation and coding of the results. In order to minimize researcher bias, the interview findings were reviewed by an outside rater provided by the authors of the LoU. Additionally, the interpretations and conclusions of the researcher may have been influenced by the level of involvement with participants in the study and the commitment to course success. Additionally, the LoU was conducted to help control for history, since there was no posttest for the control. The LoU served as a form of posttest instrument.

Recommendations

Suggestions for further research that could provide additional information for initiation of professional development programs in educational technology for faculty are presented below.

1. A longitudinal study should be conducted to determine if the faculty continue to use educational technology in their classrooms.
2. The professional development program should be presented by several facilitators to determine course impact rather than instructor effectiveness.
3. A similar project should be initiated in several educational institutions to determine if the research design used in this study will work in those institutions.
4. Based on the level of interest, the college where the participants were employed should continue to include educational technology training programs as part of their faculty professional development program.

Summary

It appears, in spite of its limitations, that this study has added to the body of existing literature supporting the use of professional development to alleviate faculty concerns about the planning and use of educational technology. This study also added to the existing literature supporting the use of the CBAM as an instrument for measuring concerns about innovative educational practices.

This study documented the effectiveness of a workshop in supporting a creative environment in which faculty begin sharing knowledge and collaborating in the use of educational technology.

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Appendix A
Stages of Concern Questionnaire

Educational Technology
Wilmington College

Concerns Questionnaire

The purpose of this questionnaire is to determine what concerns people have about using Educational Technology. Some of the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle one (1) on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale. The scale is a continuum with four reference points along an eight point scale. Ranges for each anchor are indicated below:

This statement is very true of me now.	1	2	3	4	5	6	7	8
This statement is somewhat true of me now.	1	2	3	4	5	6	7	8
This statement is not true of me now.	1	2	3	4	5	6	7	8
This statement seems irrelevant to me.	1	2	3	4	5	6	7	8

For example:

1. I like to watch TV.	1	2	3	4	5	6	7	8
------------------------	---	---	---	---	---	---	---	---

I feel this first statement is somewhat true of me now, but that feeling is not very intense. I would mark my response as shown.

2. I like to read books.	1	2	3	4	5	6	7	8
--------------------------	---	---	---	---	---	---	---	---

However, I feel this statement is also somewhat true of me now, but that feeling is more intense. I would mark my response as shown.

Please respond to the items on the following pages in terms of your present concerns, or how you feel about Educational Technology. We do not hold to any one definition of Educational Technology, so please think of it in terms of your own perception of what it involves. Thank you for taking time to complete this task.

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Procedures for Adopting Educational Innovations CBAM Project
R&D Center for Teacher Education, The University of Texas at Austin

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Concerns Questionnaire

	Not one of my interests	Somewhat one of my interests	Very true of me now
1. I am concerned about students attitudes towards educational technology.	☐	☐	☐
2. I now know of some other approaches that might work better.	☐	☐	☐
3. I do not even know what educational technology is.	☐	☐	☐
4. I am concerned about not having enough time to organize myself each day.	☐	☐	☐
5. I would like to help other faculty in the use of educational technology.	☐	☐	☐
6. I would like to know the effect of reorganization on my professional status.	☐	☐	☐
7. I am concerned about conflict between my interests and my responsibilities.	☐	☐	☐
8. I am concerned about revising my use of educational technology.	☐	☐	☐
9. I would like to develop working relationships with both our faculty and outside faculty using educational technology.	☐	☐	☐
10. I am concerned about how educational technology affects students.	☐	☐	☐
11. I am not concerned about educational technology.	☐	☐	☐
12. I would like to know who will make the decisions in educational technology.	☐	☐	☐
13. I would like to discuss the possibility of using educational technology.	☐	☐	☐
14. I would like to know what resources are available if I decide to use educational technology.	☐	☐	☐
15. I am concerned about my inability to manage all that educational technology requires.	☐	☐	☐
16. I would like to know how my teaching or administration is supposed to change.	☐	☐	☐
17. I would like to familiarize other departments or persons with the progress of this new approach.	☐	☐	☐
18. I am concerned about evaluating my impact on students.	☐	☐	☐
19. I would like to revise my instructional approach to use educational technology.	☐	☐	☐
20. I am completely occupied with other things.	☐	☐	☐

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	Not true of me <i>at all</i> Incident	Somewhat true of me <i>now</i>	Very true of me <i>now</i>					
21. I would like to modify my use of educational technology based on the experiences of my students.	1	2	3	4	5	6	7	8
22. Although I do not know about educational technology, I am concerned about things in this area.	1	2	3	4	5	6	7	8
23. I would like educational technology to excite my students.	1	2	3	4	5	6	7	8
24. I am concerned about time spent working with nonacademic problems related to educational technology.	1	2	3	4	5	6	7	8
25. I would like to know what the use of educational technology will require in the immediate future.	1	2	3	4	5	6	7	8
26. I would like to coordinate my efforts with others to maximize the impact of educational technology.	1	2	3	4	5	6	7	8
27. I would like to have more information on time and energy commitments required by educational technology.	1	2	3	4	5	6	7	8
28. I would like to know what other faculty are doing in this area.	1	2	3	4	5	6	7	8
29. At this time I am not interested in learning about educational technology.	1	2	3	4	5	6	7	8
30. I would like to know how to supplement, enhance, or replace educational technology.	1	2	3	4	5	6	7	8
31. I would like to use feedback from students to change the program.	1	2	3	4	5	6	7	8
32. I would like to know how my role will change when I am using educational technology.	1	2	3	4	5	6	7	8
33. Coordination of tasks and people is taking too much of my time.	1	2	3	4	5	6	7	8
34. I would like to know how educational technology is better than what we are doing now.	1	2	3	4	5	6	7	8

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Appendix B
Technology Inventory

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Technology Inventory

Age

1. Please check the appropriate response

20 or under
21 to 30
31 to 40
41 to 50
51 or over

☐ ☐ ☐ ☐ ☐

Education

2. How much schooling have you formally completed?

Graduate School
High School
Some College
Bachelor's Degree
Master's Degree
Doctoral Degree

☐ ☐ ☐ ☐ ☐ ☐ ☐

Ethnic Background

3. What is your ethnic background?

Black, not Hispanic
Hispanic
American Indian
Asian Pacific Islander
White and Hispanic
Other

☐ ☐ ☐ ☐ ☐ ☐

Gender

4. What is your gender?

Female
Male

☐ ☐

Experience

5. How many years have you worked in Higher Education, either full or part time

Less than one year
1-2 years
3-5 years
6-10 years
11-15 years
16-25 years
26 years or more

☐ ☐ ☐ ☐ ☐ ☐ ☐

Page: 1

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Position

6. Which of the following best describes your academic staff position

Non-teaching staff
 Part-time faculty
 Full-time faculty

☐ ☐ ☐ ☐

Access to Technology

7. Do you know how to use the Internet

No Yes

☐ ☐

8. Do you know how to use e-mail

☐ ☐

9. How often do you access the Internet

A Good Deal
 Quite a Little
 Sometimes
 A Good Deal
 Only a Little
 Almost Never
 Never

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

10. How often do you use e-mail

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

11. How often do you use pre-produced video in your classroom

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

12. How often do you require your students to use the Internet

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

13. How often do you use e-mail with your students

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

How often do you use any of the following in your home or office

14. TV

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

15. VCR

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

16. Camera

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

17. Camcorder

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

18. Telephone

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

19. Fax machine

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

20. Computer

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

21. Video games

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

22. Slide projector

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

23. Answering machine

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

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24. Voice mail
25. E-mail
26. Internet

A Considerable Amount
Only a Little
Almost None
None
A Great Deal
Quite a Lot
Do not Know

○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○

How often do you use the following software applications

27. Word processing
28. Spreadsheet
29. Presentation (for example, Powerpoint)
30. Computer-generated tests
31. Computer grade book
32. Internet search engine
33. Computer assisted graphing
34. Machine level computer programming

○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
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○ ○ ○ ○ ○ ○ ○ ○ ○ ○

How do you maintain contact with your students

35. Before and after class
36. Office hours
37. By phone
38. By fax
39. By e-mail
40. By regular mail
41. By computer (Internet, chat room, etc)
42. What types of technology training have you had (continue on reverse if necessary)

○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
○ ○ ○ ○ ○ ○ ○ ○ ○ ○
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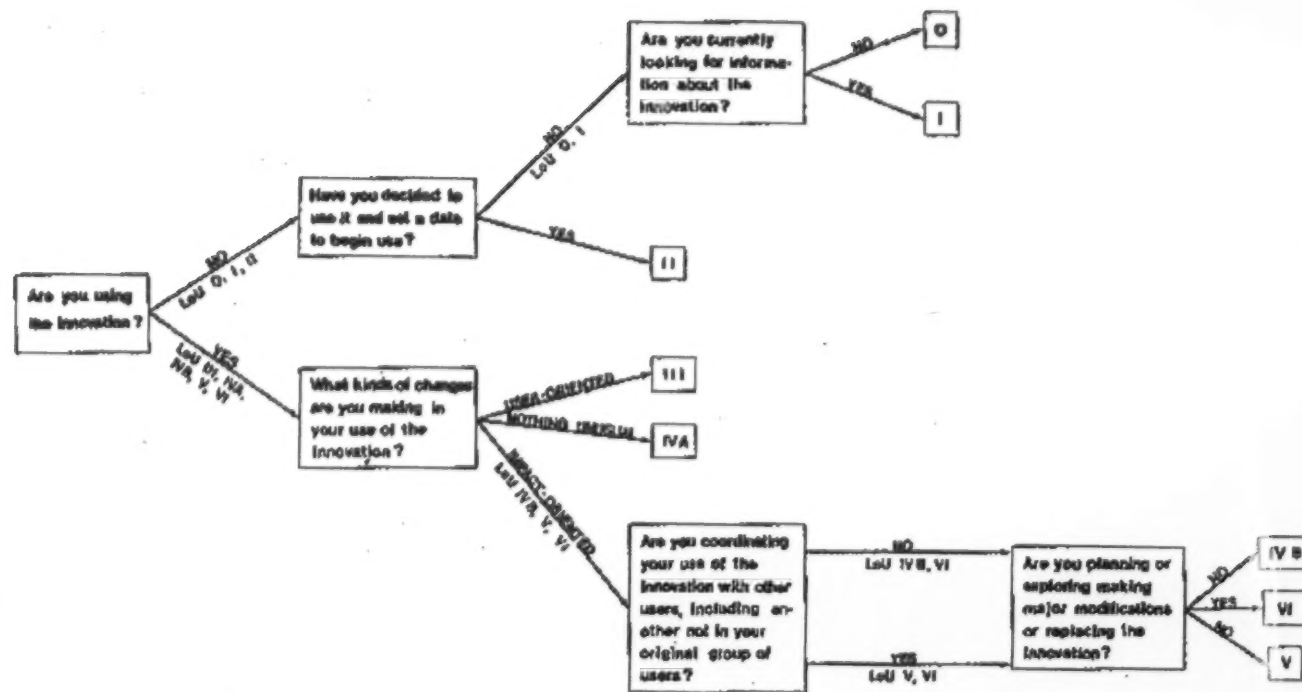
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Appendix C

Level of Use Interview

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Question	Purpose
Are you using the innovation?	To distinguish between users and nonusers; to break LoU 0-II from LoU III-VI.
IF YES	
What do you see as the strengths and weaknesses of the innovation in your situation? Have you made any attempt to do anything about the weaknesses?	To probe Assessing and Knowledge categories.
Are you currently looking for any information about the innovation? What kind? For what purpose?	To probe Acquiring Information category.
Do you ever talk with others about the innovation? What do you tell them?	To probe Sharing category.
What do you see as being the effects of the innovation? In what way have you determined this? Are you doing any evaluating, either formally or informally, of your use of the innovation? Have you received any feedback from students? What you have done with the information you get?	To probe Assessing category.
Have you made any changes recently in how you use the innovation? What? Why? How recently? Are you considering making any changes?	To distinguish between LoU III (user-oriented changes), LoU IV B (student-oriented changes) and LoU IV A (no or routine changes); to probe Status Reporting and Performing categories.
As you look ahead to later this year, what plans do you have in relation to your use of the innovation?	To probe Planning and Status Reporting categories.

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Figure 4 (continued)

Question	Purpose
Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination? Are you considering or planning to make major modifications or to replace the innovation at this time?	To separate LoU V from III, IV A and IV B. If a positive response is given, LoU V probes (below) are used. To separate LoU VI from III, IV A, IV B and V.
LoU V Probes How do you work together? How frequently? What do you see as the strengths and the weaknesses of this collaboration? Are you looking for any particular kind of information in relation to this collaboration? When you talk to others about your collaboration, what do you share with them? Have you done any formal or informal evaluation of how your collaboration is working? What plans do you have for this collaborative effort in the future?	

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Figure 4 (continued)

Question	Purpose
IF NO Have you made a decision to use the innovation in the future? If so, when? Can you describe the innovation for me as you see it? Are you currently looking for any information about the innovation? What kinds? For what purposes? What do you see as the strengths and weaknesses of the innovation for your situation? At this point in time, what kinds of questions are you asking about the innovation? Give examples if possible. Do you ever talk with others and share information about the innovation? What do you share? What are you planning with respect to the innovation? Can you tell me about any preparation or plans you have been making for the use of the innovation? Can you summarize for me where you see yourself right now in relation to the use of the innovation? (Optional Question)	
	To separate LoU 0 from I; to probe Status Reporting, Planning and Performing categories. To separate LoU I from II. To probe Knowledge category. To probe Acquiring Information category. To probe Assessing category. To probe Assessing, Sharing and Status Reporting categories. To probe Sharing category. To probe Planning category. To get a concise picture of the user's perception of his/her use or nonuse.

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Figure 4 (continued)

Question	Purpose
Past Users Why did you stop using the innovation? Can you describe for me how you organized your use of the innovation, what problems you found, what its effects appeared to be on students? When you assess the innovation at this point in time, what do you see as the strengths and weaknesses for you?	

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Appendix D
Level of Use Matrix

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LEVEL OF USE RATING SHEET (CBAM, 1975)

Tape #: _____
Date: / / 75

Site:
I.D. #:

Interviewer:
Rater:

Level	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
Non-Use	0	0	0	0	0	0	0	0
D.P. A								
Orientation	I	I	I	I	I	I	I	I
D.P. B								
Preparation	II	II	II	II	II	II	II	II
D.P. C								
Mechanical Use	III	III	III	III	III	III	III	III
D.P. D-1								
Routine	IVA	IVA	IVA	IVA	IVA	IVA	IVA	IVA
D.P. D-2								
Refinement	IVB	IVB	IVB	IVB	IVB	IVB	IVB	IVB
D.P. E								
Integration	V	V	V	V	V	V	V	V
D.P. F								
Renewal	VI	VI	VI	VI	VI	VI	VI	VI
User is not doing:	ND	ND	ND	ND	ND	ND	ND	
No information in interview:	NI	NI	NI	NI	NI	NI	NI	

Is the individual a past user? Yes No

How much difficulty did you have in assigning this person to a specific LoU? None 1 2 3 4 5 6 7 Very much

Comments about interviewer --

General Comments --

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Figure 5: LoU Rating Sheet

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Appendix E

Authorization to Use Concerns Based Adoption Model

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Joyce Pollard, Ed.D.
 Director
 Office of Institutional Communications
 and Policy Services
 Southwest Educational Development
 Laboratory
 211 E. Seventh St.
 Austin, TX 78701-0281

Dear Dr. Pollard:

I am requesting permission to reprint/reproduce (in the case of videotapes) the following:

STAGES OF CONCERN QUESTIONNAIRE

I intend to use the reprinted/reproduced information in the following way/with the designated audience (please attach examples):

AS PART OF A DISSERTATION; AUDIENCE WILL BE

FULL AND PART-TIME FACULTY AND ADMINISTRATORS OF

A SMALL, PRIVATE LIBERAL ARTS COLLEGE.

In the case of a videotape, I agree to duplicate the tape in its entirety without editing, splicing, or obliterating SEDL's copyright. I further agree to use or distribute the copies at no cost to the designated audience(s). Finally, I agree to give appropriate attribution (citations or reference) to the Southwest Educational Development Laboratory.

Name: CHARLES M. POPLOS

Address: 305 SANDBURG PLACE
NEWARK, DE 19702

Telephone Number: (202) 453-3747

E-mail: poplos@hopi.ctcc.edu

APPROVED: Joyce A. Pollard DATE: 2/5/98

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Appendix F

Cover Letter Seeking Volunteers for Study

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MEMORANDUM

TO: Full-Time Faculty and Adjunct Professors

FROM: Ronald C. Watts 

SUBJECT: Faculty Surveys and Development
Re: Educational Technology

DATE: February 24, 1998

A) Faculty Surveys

As part of a Wilmington College Ed.D. student's dissertation project, the concerns and needs of faculty regarding the use of educational technology at our College are being assessed. The results of this assessment will provide the College with a better understanding of the ways and means to support instructional technology.

Enclosed are two surveys, one was developed by the Research and Development Center for Teacher Education, University of Texas at Austin and was designed to obtain opinions about educational technology. The other survey is a technology inventory that focuses on faculty characteristics and access to technology. Please take a few moments to complete these surveys and return the completed questionnaires in the enclosed envelope.

B) Faculty Development Seminar

To help our faculty develop instructional technology expertise and to integrate technology into instructional processes, a seminar entitled "Introduction to Educational Technology" will be held for a six day period of 1 1/4 hours each, from April 9, 1998 through May 21, 1998, exclusive of the week of April 13th. Because of limited space and equipment, the seminar will only accommodate 25 faculty members. We will attempt to include participants from all Academic Divisions.

The seminar, which will focus on the integration of technology into courses, will be customized to fit the course subject matter interests of the faculty participants. Participants will be expected to complete a questionnaire at the conclusion of the seminar.

The seminar sessions, 1 1/4 hour each, will be the following:*

Session 1: Introduction to Distance Learning Technology
4/9/98
3:30-4:45

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Session II: Technology and Curriculum Development

4/23/98

3:30-4:45

Session III: Video as Technology Enhancement

4/30/98

3:30-4:45

Session IV: Personal Technology Planning

5/7/98

3:30-4:45

Session V: Presentation Software

5/14/98

3:30-4:45

Session VI: Implementation and Benchmarking

5/21/98

3:30-4:45

The seminar sessions will take place in the Educational Technology Laboratory Screening Room, P-229, People's Library building, New Castle Campus. Mr. Charles Poplos will be the facilitator. Participants will leave this seminar with a video tape of a segment of the course content of their choice and a floppy disk. Powerpoint techniques will be an emphasis.

If you wish to participate in this seminar, please complete the enclosed seminar interest form and return it along with your completed survey in the envelope provided. Please complete and return the questionnaire even if you do not wish to participate in the seminar.

Please call me at 328-9401, x136 if you have questions concerning this opportunity.

Enclosure: Questionnaires

Seminar Interest Form

Return Envelope

cc: Dr. Jack Varsalona

Division Chairs

*In addition to the six general course sessions, arrangements have been made at the New Castle campus for participants to individually video tape a segment of one of their lessons and surf the Internet. All information, materials, and equipment will be provided.

BEST COPY AVAILABLE

**Introduction to Educational Technology Seminar
April 9 - May 21, 1998
Seminar Interest Form**

DATE: _____

NAME: _____

DIVISION: _____

I am interested in participating in the College-sponsored seminar, "Introduction to Educational Technology." I can attend all scheduled sessions and understand that arrangements will be made for an individual taping session and opportunity to surf the Internet.

BEST COPY AVAILABLE